KALMIOPSIS

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Biddle's Lupine (*Lupinus biddleyi*)

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KALMIOPSIS

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EDITORIAL

In 1961, the Native Plant Society of Oregon was founded in Portland. Since then our society has expanded to a nearly 1,000 members statewide, with 13 chapters. Thus, 2011 marks the 50th year that NPSO members have been visiting the wild places of Oregon to enjoy, conserve, and study its natural vegetation. Our annual journal, *Kalmiopsis*, is much younger. The idea of a journal was shared by several members, including Stu Garrett of the High Desert Chapter (Bend) and Frank Lang of the Siskiyou Chapter (Ashland). During his tenure as President of the NPSO State Board in 1989 and 1990, Stu Garrett was influential in launching the journal. The first Editorial Board included Stu Garrett, Susan Kephart and Rhoda Love. In 1990 NPSO sponsored a contest to name its new journal, and Rhoda Love submitted the winning suggestion of *Kalmiopsis*. Frank Lang served as the first editor and produced the first three issues in 1991, 1992 and 1993. David Kennedy, also of the Siskiyou Chapter, edited the next three issues (1994-1996). In 2001, I joined Editor Linda Ann Vorobik and we produced two issues, one a Festschrift for Ken Chambers. Linda was no stranger to *Kalmiopsis*, having created the logo of *Kalmiopsis* flowers which has graced the front cover masthead since the first issue. She stayed on for one more year as co-editor; then in 2003 she moved over to the Editorial Board to fill the vacancy after Stu Garrett stepped down. The following year she moved on and Frank Lang returned to *Kalmiopsis* on its Editorial Board. My first major change in flying solo was a color cover (although David Kennedy deserves credit for the first color cover in 1996). This year marks our 18th publication since *Kalmiopsis* began 21 years ago. All issues are now available on the NPSO website, thanks to Les Gottlieb and Norm Jensen. Norm Jensen prepared an online index of all articles and authors, so that we didn't need to expend resources on printing one. Rhoda Love has been the "Energizer Bunny" of *Kalmiopsis*; in addition to writing a total of seven articles (by herself or with co-authors), she has edited all of the articles by other authors. We've published a total of 81 articles about Oregon's plants and botanists, not counting book reviews and tributes to Fellows. All of this effort has been contributed by volunteers. Our authors receive no reimbursement other than our thanks for sharing their knowledge of our rich botanical heritage and recording in print the botanical stories that might otherwise be forgotten as the years slip away. If you have knowledge to share about Oregon's native plants, we're interested in helping you publish in our journal.

–Cindy Roché, Editor

Cover Photo: Biddle's lupine (*Lupinus biddleyi*) is found in only a few populations along the eastern escarpment of Steens Mountain. Photo by Kareen B. Sturgeon.

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Botanizing Along the East Side of Steens Mountain: Some Lessons Learned on a Field Trip to Southeastern Oregon

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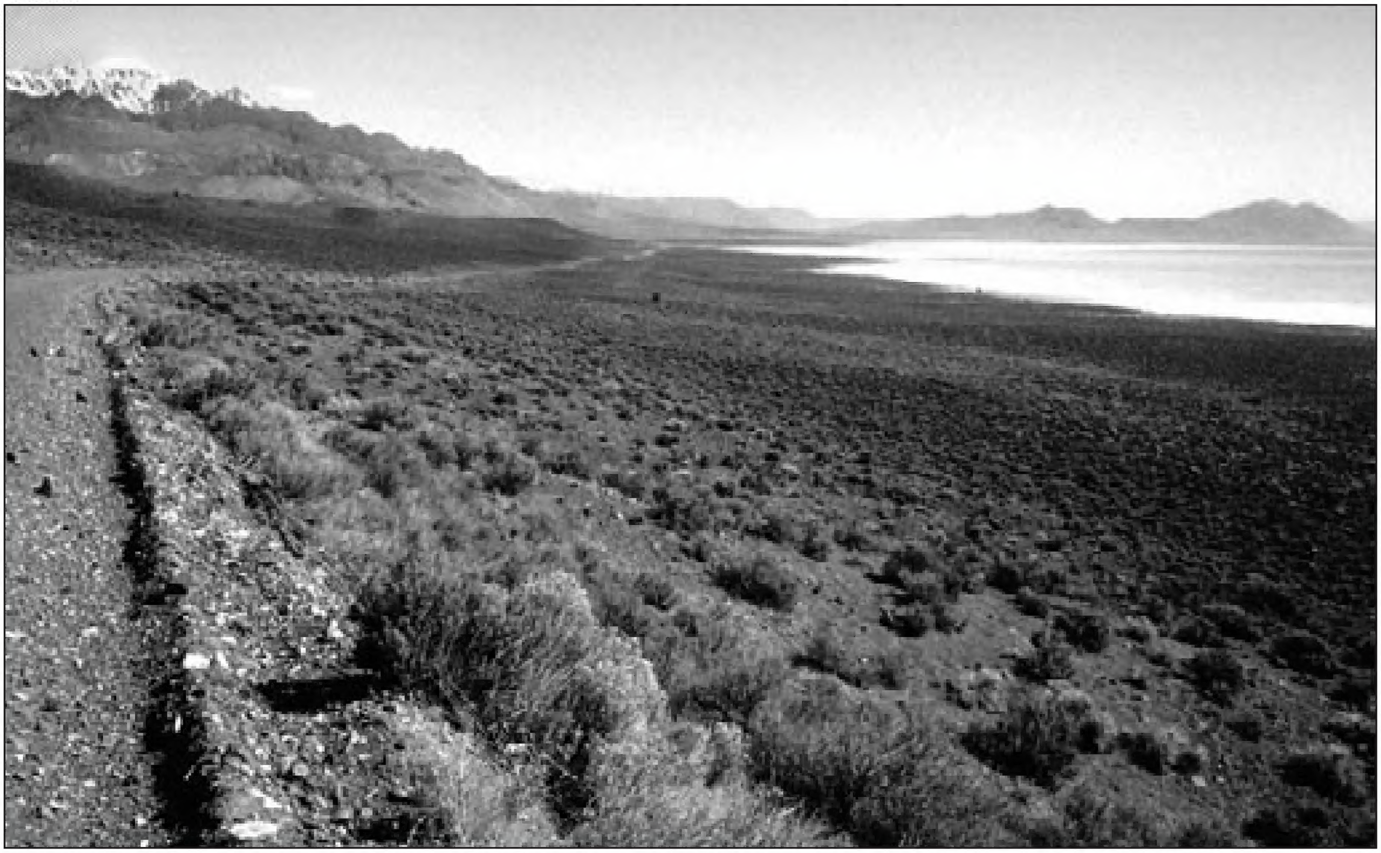

Steens Mountain and the western edge of the Alvord Desert from East Steens Road. The desert is a remnant of Alvord Lake that extended for 100 miles to the north and south during the Pleistocene. Photo by author.

It's why those of us who write about landscape are so interested in science, too. It's not in order to categorize the wildflowers, to make lists of things, but to make our vision...go deeper and deeper. The more I learn, the more I see. And the more I see, the more I learn." –Gretel Ehrlich, quoted in Trimble (1988)

The vans are not yet one block from Murdock Hall when bags of chips and cookies are ripped open, a sure sign that the field trip has officially begun.

For most of the 27 years I taught at Linfield College, I made a five-day road trip to southeastern Oregon with students in my biology majors class, Systematics of Flowering Plants. Our destination was the east side of Steens Mountain (9,733 ft.), the northern-most fault block mountain in the Great Basin, 50 miles south of Burns in Harney County.

Why drive this distance, nearly 500 miles from our home in McMinnville? For one thing, many of my students have no knowledge of what lies east of the Cascade Mountains. The country is spectacularly beautiful, and the Shrub Steppe and Desert Scrub Vegetation Zones offer a sharp contrast to the Willamette Valley and west side forests so familiar to us. Like all such field trips, the experience provides an unparalleled opportunity for scientific study and for reflection on the value of native species and landscapes. The students are required to make a plant collection and, in early May, the floral diversity along the east side of the escarpment is much greater than what we could see in the northern Willamette Valley at that time of year.

On the Road

Our itinerary takes us across five ecoregions, each one characterized by relatively homogeneous ecological factors, such as climate, physiography, soil and vegetation. I instruct the students to keep their eyes open for the dramatic changes in vegetation we will see as we traverse the state, from McMinnville (with an average annual precipitation of 44 inches) to our destination at Fields (less than 7 inches). Once on the road, we leave behind the agricultural fields and oak groves (*Quercus garryana*) characteristic of the Willamette Valley Ecoregion, travel up in elevation into the Western Cascades, over the crest of the range, and drop down through the Eastern Cascades and onto the High Lava Plains before we reach our destination in the Basin and Range Ecoregion. Along the way, we make a few stops, notably at the Maples Rest Area where a winding trail leads us along the Santiam River through a typical low elevation (1,000 ft.) temperate forest of western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii* var. *menziesii*), and western red cedar (*Thuja plicata*). We make another stop at the Little Nash Crater lava flow consisting of basaltic rocks that are surrounded by forests of true fir and harbor pockets of golden chinquapin (*Chrysolepis chrysophylla*), the showy *Penstemon davidsonii* var. *menziesii*, vine maple (*Acer circinatum*), and parsley fern (*Cryptogramma crispa*). We pass through forests of mountain hemlock (*Tsuga mertensiana*), subalpine fir *(Abies lasiocarpa*), and Engelmann spruce (*Picea engelmannii*) before dropping down along one of the steepest precipitation gradients in the world. Over a distance of only 20 miles of relatively flat terrain, precipitation decreases by 60 inches, a fact reflected in the equally dramatic changes in the vegetation. Forests of true fir (*Abies* spp.), lodgepole (*Pinus contorta* subsp. *latifolia*) and ponderosa pines (*Pinus ponderosa*) quickly give way to stands of almost pure ponderosa pine, then, western juniper (*Juniperus occidentalis*). In Bend, we turn east on Highway 20 and head out across the High Lava Plains before reaching the Basin and Range Ecoregion, where trees give way to shrubs, such as big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and rabbitbrush (*Ericameria* and *Chrysothamnus*). Amazing state, Oregon! All this diversity of landscape in our first day's drive from McMinnville.

Catlow Valley with arrowleaf balsamroot *(Balsamorhiza sagittata)* growing on the Catlow Rim. Photo by author.

Into the Great Basin: Glass Butte, Wright's Point, and the Catlow Rim

Traveling at 65 mph on the highway east of Bend, it's easy to miss the incredible floral diversity concealed by the dominant sagebrush. So, about 70 miles east of Bend, we make a short stop at Glass Butte, long a favorite hunting ground for those seeking the beautiful obsidian unique to this rhyolitic dome. We spot a single yellowish-white lupine among the blue-flowered desert lupine (*Lupinus lepidus* var. *aridus*) growing abundantly at the site. The students want to know whether this is a different species of lupine or a mutant form of the desert lupine. I ask them to consider what evidence favors one hypothesis or the other. At this point, the answer to their question is not yet fully apparent to them, but they will work it out before the trip is over.

Having stocked up on provisions at the supermarket in Burns, we head south along Highway 205, and make a stop at Wright's Point, an inverted topography representing an ancient river bed filled with sediments, then lava, and now elevated by erosion of the surrounding softer

A flat near Fields dominated almost exclusively by winterfat (*Krascheninnikovia lanata*). Winterfat is a member of the Amaranth Family (*Amaranthaceae*) many of whose members are halophytic. Photo by author.

sediments. It offers a sweeping view of the Harney Basin, a major ranching and farming area and home to the 187,000-plus acre Malheur National Wildlife Refuge. A colleague who joined us on one trip commented as she gazed out over the vast, flat, treeless landscape, "I guess this is what is meant by *stark beauty*." We continue south, passing the turnoff for the Malheur Field Station, stopping for R & R at Frenchglen, a charming town consisting of not much more than a gas station, general store, and historic hotel, and continue into the Catlow Valley. Along the Catlow Rim, we find arrowleaf balsamroot (*Balsamohriza sagittata*) growing in abundance and in full bloom, and students want to collect some.[1] "See if you can get the root," I instruct them. After about three feet of digging and the root apex nowhere in sight, they abandon the

According to Mansfield (2000), the silvery tailcup lupine (*Lupinus argenteus* var. *heteranthus*) is "a northwestern Great Basin variety of a large, complex, western lupine." Photo by author.

Lithosol with Nevada onion (*Allium nevadense*). Photo by author.

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[1] We follow the Native Plant Society of Oregon's *Conservation Guidelines and Ethical Code* for collecting plants (http://www.npsoregon.org/documents/ethics.pdf).

charge, marvel at this adaptation for life in an arid environment, and are content to collect some leaves and inflorescences. Shortly thereafter, the Catlow Valley Road turns east, taking us up over Long Hollow, a pass between Steens Mountain and the Pueblo Mountains to the south, and as we descend the east side, we are treated to breathtaking views of both the Trout Creek and Pueblo Mountains.

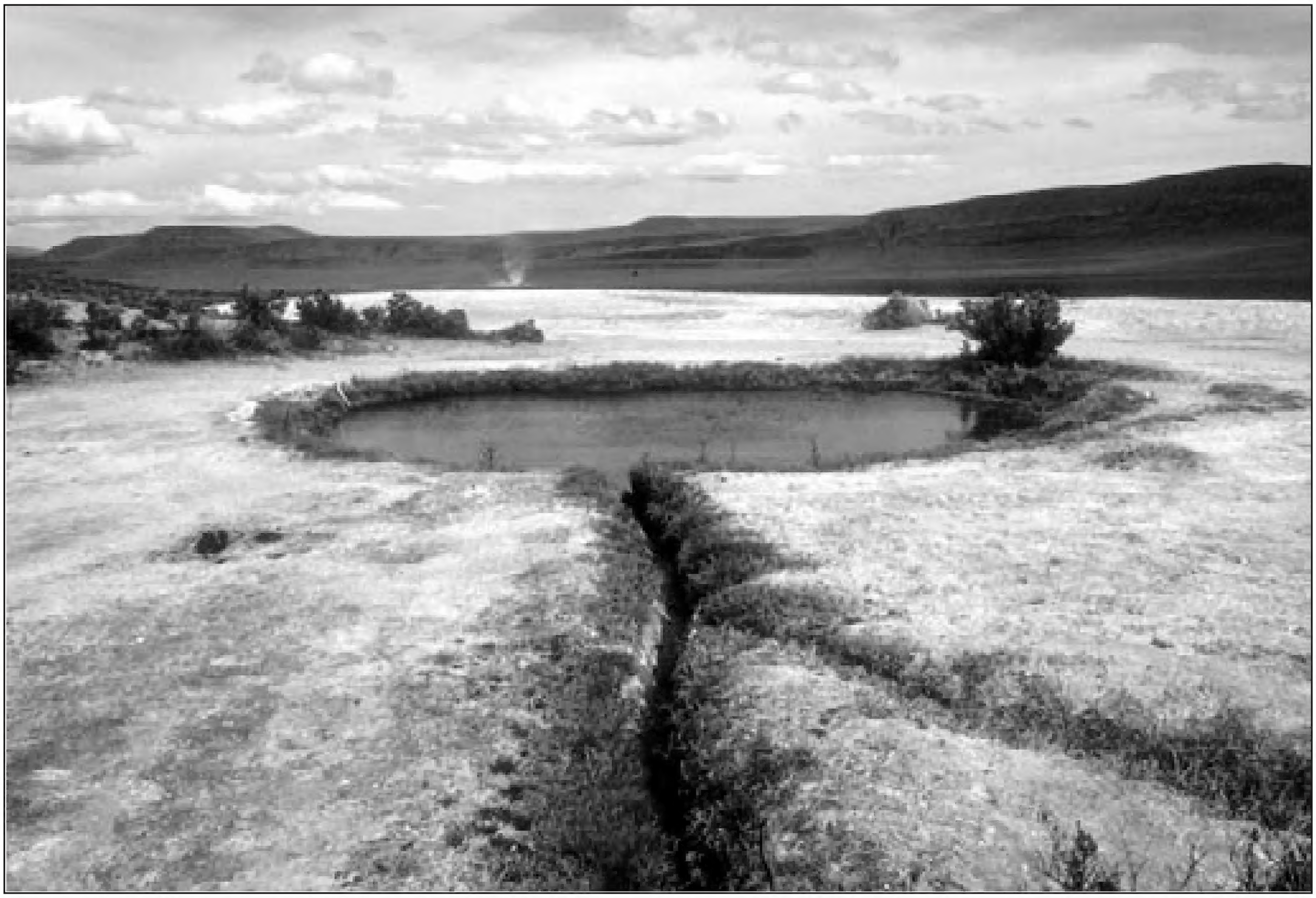
Just before the Catlow Valley Road intersects the East Steens Road, a sign alerts us to "congestion" ahead, and a few tenths of a mile later, another sign announces that we've arrived at our destination, Fields, Oregon, population six. We've arranged to take over the four-room Fields Motel, and Charlotte Northrup, whose family owned the motel and small café at the time, greets us with large plates of spaghetti, salad, and her famous chocolate milkshakes.

Saline Soils, Lithosols, and the Alvord Desert

After a good night's sleep, we are met by Rick Hall, Natural Resource Specialist (now retired), from the Burns District of the Bureau of Land Management (BLM), who will accompany us on our journey in this part of the Basin and Range Ecoregion, named for the series of north-south uplift mountain ranges between which are basins with no drainage to the sea. Our first stop is just three miles north of Fields. About 100 feet west of East Steens Road, we spot a flat dominated almost exclusively by winterfat (*Krascheninnikovia lanata*). This low, scrubby, dense-wooly plant provides us with our first exposure to one of two vegetation zones we will encounter along the escarpment. The Desert Scrub Vegetation Zone is found typically in old lakebeds (*playas*) where evaporation greatly exceeds precipitation and consequently the soils are highly saline. Winterfat is the most salt tolerant of the many shrubs we will encounter and is a typical representative of the Amaranth Family (*Amaranthaceae*) many of whose members are halophytic, capable of tolerating salty soils.

We venture up on a rocky hillside immediately to the west. Rick warns us that there are rattlesnakes here, so we step carefully. Nevertheless, one student is buzzed, the snake retreats from view, and we are on alert to take extra care where we place our hands and feet. Students collect yampah (*Perideridia bolanderi*), bitterroot (*Lewisia rediviva*), Nevada onion (*Allium nevadense*), and biscuitroot (*Lomatium canbyi*) and come to understand why these rocky soils (lithosols) are often referred to as "Indian grocery stores." Each of these species served as an important food source for Native Americans who once lived here.

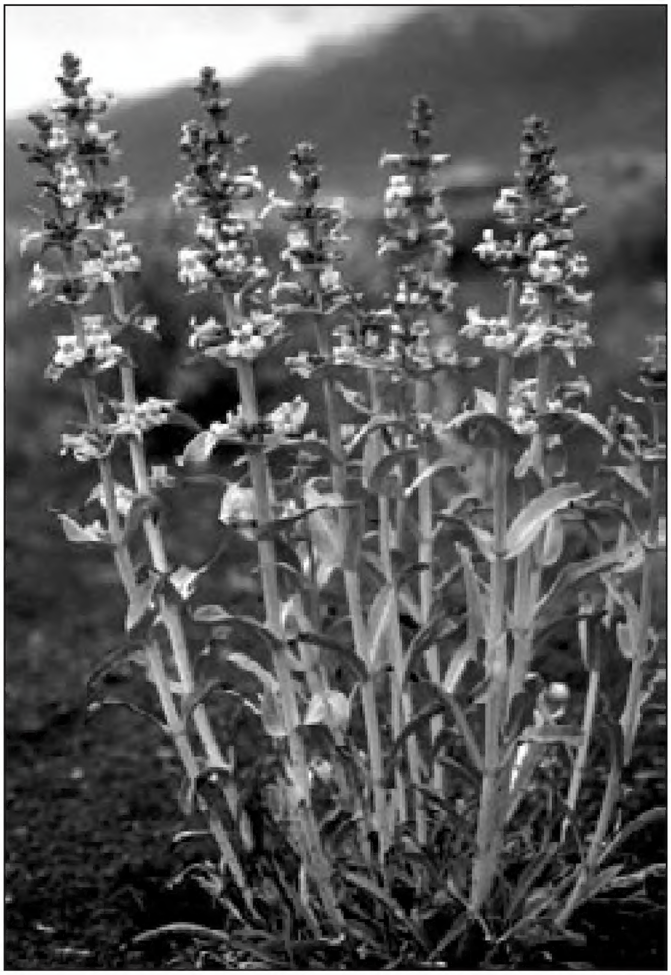
Twenty-two miles north of Fields, we stop at Pike Creek, ford the stream, and climb up on the hillside for a sweeping view of the Alvord Desert, a dry lakebed that is inundated in early spring and in wet years to form a shallow lake. The Desert itself is a remnant of the Pleistocene Alvord Lake that once extended 100 miles to the north and south. The Alvord is rimmed by geothermal features and, from the top of the hill, we look north toward Mickey Hot Springs, our next stop. On our climb back down the hillside, we spot ballhead waterleaf (*Hydrophyllum capitatum* var. *alpinus*) one



White crust indicative of saline soils at Mickey Hot Springs ACEC. Photo by author.

of the many herbaceous perennials whose beautiful showy flowers stand out dramatically against the numerous wind-pollinated shrubs with their inconspicuous flowers.

Thirty-one miles north of Fields, we turn east on a narrow unimproved dirt road. On the sandy soils by the roadside, we find sharp-leaved penstemon (*Penstemon acuminatus* var. *latebracteatus*). Proceeding east, we round a point and arrive at the Mickey Hot Springs Area of Critical Environmental Concern (ACEC) created by the BLM to protect its geothermal features: bubbling mud pots, steam vents and hot springs. Wherever we look, a white crust reveals the presence of saline/alkaline soils, and we are introduced to a suite of halophytic desert shrubs, each with a different adaptation for tolerating the salts. Winterfat roots exclude salts at the point of entry; the fleshy leaves of greasewood (*Sarcobatus vermiculatus*) dilute the salt; and, with the naked eye, we can see the glistening salt crystals excreted from the leaves of shadscale (*Atriplex confertifolia*). Nine species of *Atriplex* can be found in the Steens Mountain area, and most possess an efficient form of photosynthesis that enables them to minimize the evaporation of water from leaf surfaces, which is critical in this environment where the average annual precipitation is a mere seven inches. These plants possess an enzyme that can bind to CO_2 under very low concentrations of the gas, so they are able to keep their stomates nearly closed during the heat of the day. They store the CO_2 as a four-carbon compound (hence, their name C4 plants) in special cells in their leaves where they use the normal C3 photosynthetic pathway to fix it into glucose.

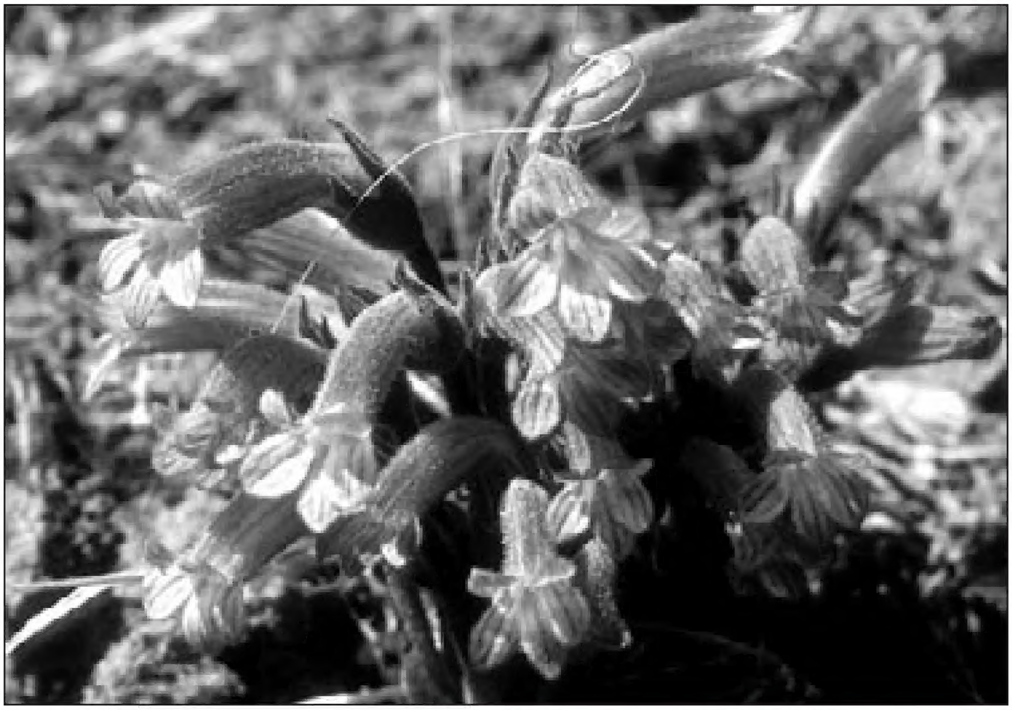


The glabrous and glaucous sharp-leaved penstemon (*Penstemon acuminatus* var. *latebracteatus*) growing on sandy soil near Mickey Hot Springs ACEC. Photo by author.

The More I Learn, the More I See, and the More I See, the More I Learn

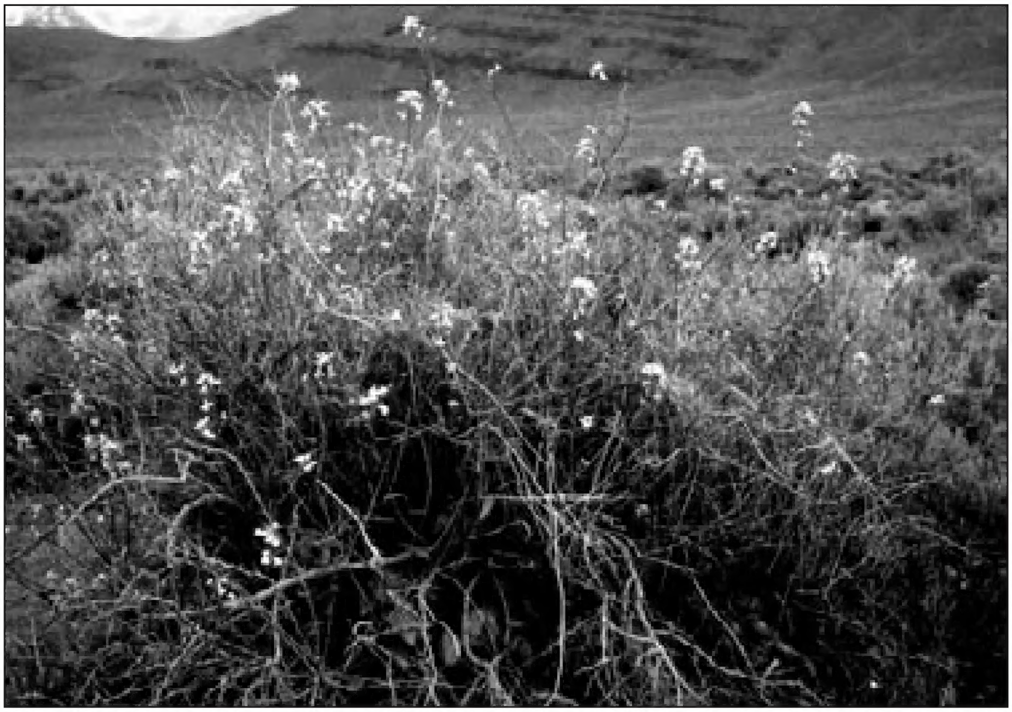
On the better-drained soils, we find budsage (*Artemisia spinescens*), catclaw horsebrush (*Tetradymia spinosa*), and little leaf horsebrush (*Tetradymia glabrata*). At first glance, these and the other shrubs we've seen look alike: low, scrubby, nondescript plants with inconspicuous flowers, and small leaves covered with white hairs. Moreover, several of the shrubs are dioecious, making identification doubly difficult: when in bloom or in fruit, male plants look decidedly different from female plants of the same species. "We will never be able to tell the species apart," lament the students. But it doesn't take long for them, first, to get a feeling for the different species, to detect each one's *gestalt*. Then, on closer inspection, the students begin to see more detail, and soon they are adept at distinguishing among them.

More questions arise: "Why do so many of the herbs seem to be buried in or under the shrubs?" The students have detected a pattern, an observation calling out for an explanation. Every sagebrush



The clustered broomrape (*Orobanche fasciculata*) is parasitic on roots of sagebrush (*Artemisia tridentata*). Photo by author.

seems to have a desert paintbrush (*Castilleja chromosa*) growing up through its branches. A short distance away, they find a pale pink clustered broomrape (*Orobanche fasciculata*), a plant lacking any evidence of chlorophyll, concealed underneath a sagebrush. Then we see the tangled branches of a mustard (*Thelypodium flexuosum*) entwined within the branches of a greasewood shrub. When I ask the students what might account for this pattern, they venture guesses: cattle can't reach them in the shrubs (cattle evidence is ubiquitous); the specific epithet of the thelypody suggests that its stems are weak and in need of a shrub for support; and, they know that some plants without chlorophyll are parasitic: all good working hypotheses. (Later, on an exam, I ask them to come up with ideas for how they might discriminate among their hypotheses).


Stems of the weak thelypody (*Thelypodium flexuosum*) entwined within branches of a greasewood (*Sarcobatus vermiculatus*) at Mickey Hot Springs ACEC. Photo by author.

We walk a short distance south of the ACEC and find ourselves on a bare, hard surface that looks much like an exposed aggregate patio. Known as desert pavement, the surface is composed of small, densely packed and interlocking angular rocks on which few plants can take root. Several theories have been offered for how these pavements form, but the end result is that they minimize wind erosion in desert environments.

Rocks provide opportunities for moisture to accumulate, creating microhabitats for ephemeral mosses such as *Grimmia anodon*. Photo by author.

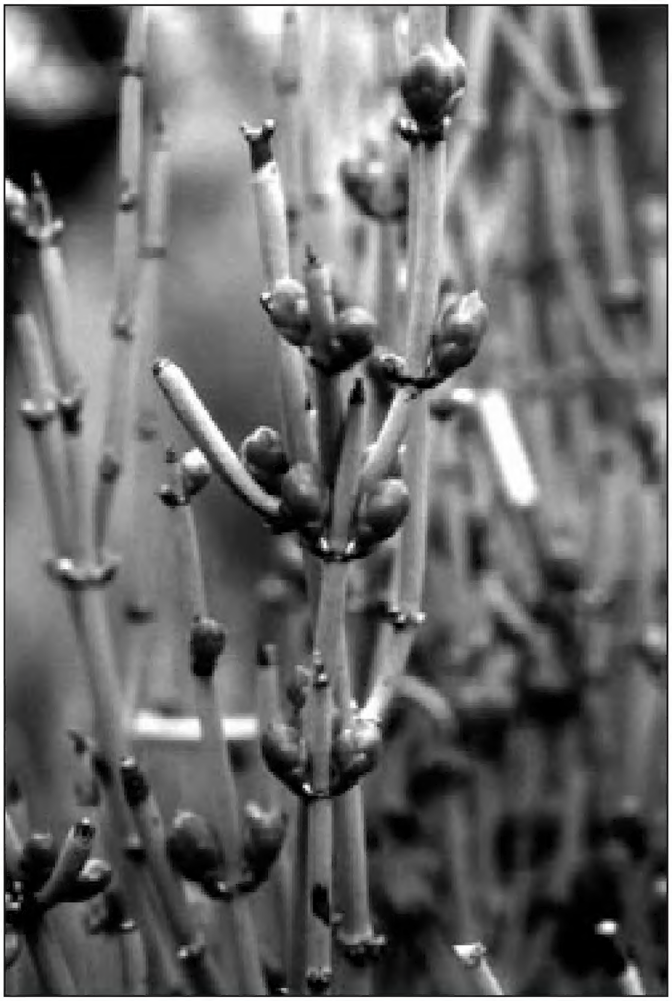
Our Vision Goes Deeper: Floral Diversity and Microenvironments

Back on the road, we continue north. Thirty-six miles north of Fields, on the east side of the road, at a site overlooking Mann Lake, we spot a pale yellow lupine growing abundantly and luxuriously within the sagebrush. Here on the well-drained soils of this gently inclined hillside, we get a look at a good example of the Sagebrush Steppe Vegetation Zone. Dominated by big sagebrush and some budsage and horsebrush, the space between the shrubs is occupied mostly by short native bunchgrasses, including bluebunch wheatgrass (*Pseudoroegneria spicata*), and numerous flowering herbaceous perennials such as the lupine. The bunchgrasses possess extensive fibrous root systems, which anchor the soil and allow the plants to rapidly absorb surface water after a rain. Unfortunately, many of the native perennial bunchgrasses have been replaced by Eurasian annual grasses, primarily cheatgrass (*Bromus tectorum*) and crested wheatgrass (*Agropyron cristatum*). Like many desert shrubs, big sagebrush is a xerophyte, a general term describing plants that possess numerous adaptations for living in arid conditions. The grey color of its leaves results from their dense covering of silvery hairs, which trap moisture and reflect heat, and from their waxy surface that retards water loss. Big sagebrush is also developmentally plastic: when water is plentiful in spring, it puts out relatively large, succulent leaves; in summer, it replaces them with smaller leaves. And, like many other desert shrubs, big sagebrush possesses a taproot that reaches for groundwater sometimes as deep as 25 feet.

But, what is this beautiful pale yellow lupine we spotted? Recalling the similarly colored solitary lupine we saw at Glass Butte, the students conclude correctly that this extensive stand of lupine must be a distinct species while the solitary specimen at Glass Butte was likely a flower-color mutant. Indeed, here we have found a patch of *Lupinus biddleyi*, a relatively rare species found in only a few locations roughly 30 miles apart but whose populations are considered stable enough not to warrant protection. In fact, we observe many young seedlings (with considerable variation in leaf morphology).

The floral diversity at all of these sites is remarkable. I overhear two students, standing as if transfixed by the display and by the snow-covered Steens in the background, whisper to one another, "Take it all in; you never know if you'll get back to see this again." One student picks a bouquet of stems from the desert paintbrush to illustrate for us the incredible variation in flower color (from scarlet, to peach, to pink and pale yellow) characteristic of this one species.

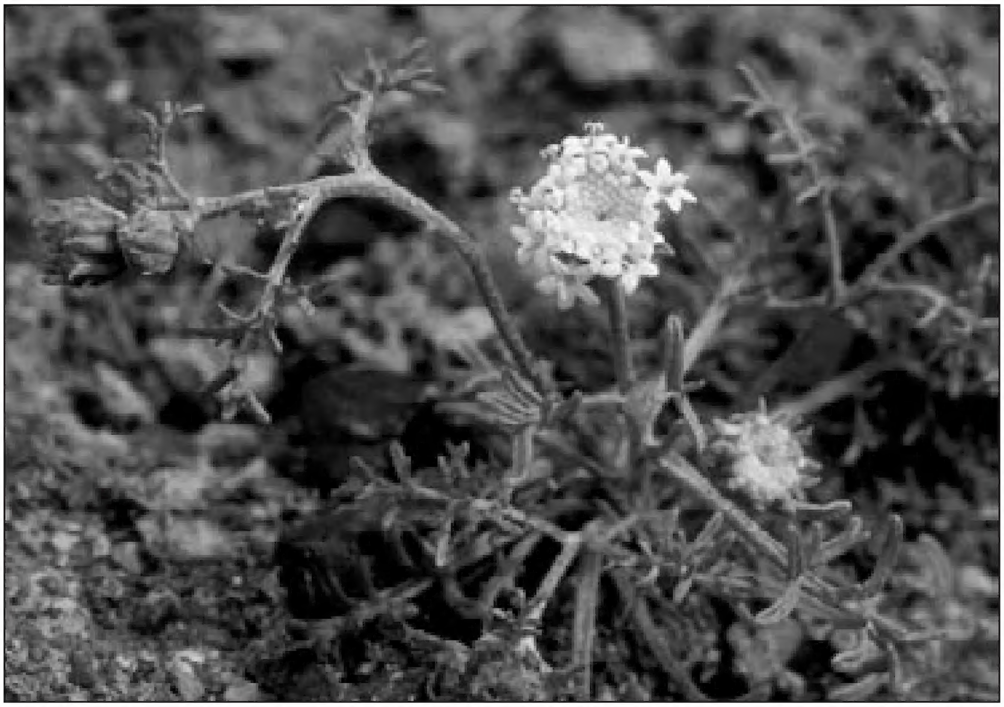
Other students are surprised to notice a rather lush growth of mosses and lichens on rocky outcrops at this site. Despite the meager rainfall that falls along the eastern escarpment of Steens Mountain, such microhabitats provide opportunities for moisture to accumulate. Mosses that occupy such sites are ephemeral; by late spring, they desiccate and go dormant. For example, when dormant, the stiff silvery awns of *Grimmia anodon* reflect sunlight, and the black pigments found in its cell walls prevent unreflected sunlight from entering the cells. When the rains return in the fall, the awns relax, the pigment becomes transparent, and the plant begins to photosynthesize and reproduce. On closer inspection, we find mosses and lichens growing as epiphytes on shrub stems and on the ground beneath the shrubs as well.



Clusters of "naked seeds," surrounded by bracts, at the stem nodes of green ephedra (*Ephedra viridis*). Photo by author.

Riparian grove of narrowleaf cottonwood (*Populus angustifolia*) along Cottonwood Creek in the Pueblo Foothills RNA/ACEC. Photo by author.

As the day winds down, we make our way back to Fields, our home away from home. After another hearty meal, we stroll in the black cottonwoods (*Populus trichocarpa*) nearby and spot a couple of great horned owl fledglings sitting as still as can be on branches almost at eye level, their fluffy skirts of down feathers still intact. But there's work to be done, so we return to the motel where we spend the evening pressing specimens and doing



Desert pincushion (*Chaenactis stevioides*), a diminutive annual growing on a steep, rocky slope in the Pueblo Foothills RNA/ACEC. Photo by author.

our best to key them out. In this part of the state, until relatively recently, no flora was available to guide our efforts. The *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973) does not cover this part of the state, and *The Jepson Manual* (Hickman 1993) is good only in so far as the distributions of California species extend into Oregon. The publication of the *Flora of Steens Mountain* (Mansfield 2000) made identification of species much more reliable.

Unusual Plants, Protected Plants and Landscapes

The next morning, we head south about nine miles to Cottonwood Creek and the Pueblo Foothills Research Natural Area (RNA)/ ACEC. The ribbon of green trees that decorates this otherwise pale brown landscape is a welcome sight. We meander through the riparian area, shaded by a grove of narrowleaf cottonwoods (*Populus angustifolia*) and find fragrant golden currant (*Ribes aureum*) blooming in abundance. I spot Nevada ephedra (*Ephedra nevadensis*) and explain to the students, rather excitedly, that this is perhaps the northernmost limit of this species, which is more abundant throughout other parts of the Great Basin. But, to the students, the shrub looks pretty much like a bunch of dead stems: dull in color and without leaves or flowers. “You brought us all this way to show us this?” they exclaim. I continue, “Look at these reproductive structures. You can see clearly the exposed seeds: small clusters, surrounded by bracts, found at the stem nodes.” These plants are gymnosperms, plants whose seeds are not contained in an ovary as they are in the flowering plants (angiosperms). The students are, of course, familiar with other gymnosperms such as conifers, but *Ephedra* (which looks nothing like a conifer) brings home the fact that the word gymnosperm means “naked seed,” and that the large morphological diversity of plants with naked seeds reflects the fact that the various groups likely do not represent one evolutionary line but instead several lines that evolved independently of one another.

We carry on, hiking up a draw, until we find, on a steep, rocky slope, a diminutive rather non-descript annual, the desert pincushion (*Chaenactis stevioides*). Again, the initial student response is to wonder why I’ve hiked them all the way up there to see this little plant. But Rick informs them that the Pueblo Foothills RNA/ ACEC was created to protect an ecosystem characterized by this *Chaenactis* and other species. In fact, the Oregon National Areas Program recognizes this site as the best example of a narrowleaf cottonwood/ephedra community in the Basin and Range ecosystem and includes this species of *Chaenactis* on its List 4 (a taxon of conservation concern, which requires monitoring but not listing as threatened or endangered).[2] We linger: the view is expansive, even sublime, and it’s hard not to appreciate even this little plant’s contribution to our overall sensibility. I ask the students to consider why we should protect ecosystems and species such as these. In *A Sand County Almanac*, Aldo Leopold (1949) wrote (about a now extinct plant) that we grieve only for what we know. We came to know *Chaenactis stevioides* that day; the plant “became a personality” to us, and we were gratified to know that somebody cared enough to protect it.

Backtracking now, a little over three miles south of Fields we turn west onto Domingo Pass Road and drive another mile or so until we see the bright green stems of green ephedra (*Ephedra viridis*) dotting the landscape in among the sagebrush. Now Rick presents us with a challenge: find the lonesome milkvetch (*Astragalus solitarius*). Hint: it hides in sagebrush.

It takes us the better part of a half hour to find it, its white flowers, grey stems and linear leaflets perfectly camouflaged in the shrub, a disguise that serves, perhaps, to protect it from predators. We add yet another hypothesis to our list of possible explanations for why so many herbs are found tucked inside and underneath shrubs.

Return to Western Oregon

By lunchtime, we are on the road back to the west side of the mountain. About three miles south of Frenchglen, on the east side of the Catlow Valley Road, we spot a flat dominated by low sagebrush (*Artemisia arbuscula*), a mounded shrub about 12 inches tall. We agree to make one last stop. On the shallow, rocky, clay soils we find a suite of plants we had not encountered earlier, including several species of *Lomatium*, toothed balsamroot (*Balsamorhiza serrata*), and an extensive population of the beautiful, delicate desert violet (*Viola beckwithii*) with its dark purple upper petals, light purple (or sometimes pink or white) lower petals and striking bright yellow throat.

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[2] This species was later delisted; *Chaenactis macrantha,* also found at this site, remains listed.

For the rest of the afternoon, we turn our attention away from plants. We drive Center Patrol Road through the Malheur National Wildlife Refuge, watching birds and stopping only at the Buena Vista Overlook for a final look back at Steens Mountain. We spend the night at the Malheur Field Station and return to McMinnville the following day. As we descend the forested western slope of the Cascades, we feel the muscles around our eyes begin to soften and our skin rehydrate.

The next two weeks before the end of the spring semester, students spend their time drying their specimens, identifying them, pulling together the information to complete their herbarium labels, and mounting the plants for housing in Linfield's herbarium. Every year, after the semester is over, the data are entered into a computer database and sent electronically to the Oregon Flora Project at Oregon State University. Thus, the work the students have done that spring semester becomes part of the larger statewide effort to prepare a comprehensive account of the vascular plants of Oregon.

Acknowledgements

My heartfelt thanks extend to Linfield College whose support for field courses made my many trips to southeastern Oregon possible; to Rick Hall whose expert guidance took us to the most interesting sites and kept us out of harm's way; to Barbara Drake and Bill Beckman who accompanied me on so many of these trips and whose presence added to my enjoyment in countless ways. Most importantly, I thank my students whose enthusiasm for learning reinforced my commitment to make this long journey every year. I thank Doug Linn and Tara Martinak from the Burns District of the BLM for their help clarifying information about the species we identified and areas we visited and Barbara Drake, Katherine Kernberger and Henlie Sturgeon for their careful reading of manuscript drafts and helpful suggestions.

The author on the Alvord Desert with Steens Mountain (9,733 ft.) in the background. Photo by Barbara Drake.

Kareen B. Sturgeon received her BS in public health from UCLA in 1965, an MS in biology from California State University (1976) and a doctorate in biology from the University of Colorado (1980). She was a post-doctoral Research Associate in the Department of Forest Science at Oregon State University before coming to the Biology Department at Linfield College where she taught for 27 years. Kareen's research on bark beetles and their host trees took her from the Sierra Nevada to the Rocky Mountains and Cascade Range. She and her students conducted plant ecological and systematics research in Arctic Alaska, in mountainous regions of the northwest, and in Willamette Valley wet prairies. Throughout her career, she led field trips to many beautiful places throughout the northwest, to the Swiss Alps, and to Costa Rica. She was co-founder of the Cheahmill Chapter of NPSO and served as its first president. Now retired, she enjoys taking art and other classes, hiking, rafting, and more. She is a certified yoga instructor and Master Gardener and now teaches botany and plant identification each year for the OSU Extension Master Gardener training class in Yamhill County.

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At the end of a hike up a draw above Cottonwood Creek at the Pueblo Foothills RNA/ACEC, students celebrate finding the desert pincushion (*Chaenactis stevioides*).

Sandberg Bluegrass (*Poa secunda*)

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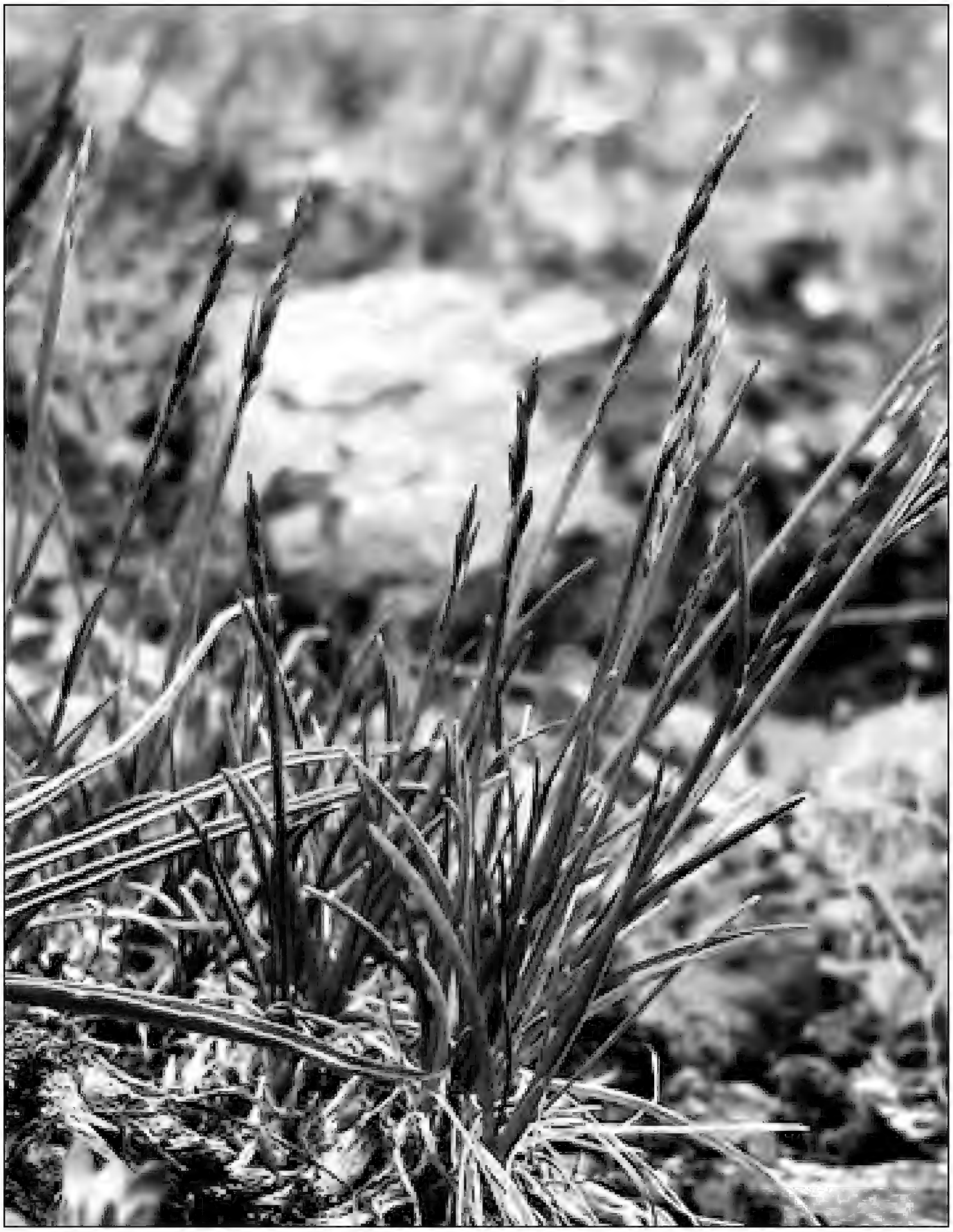
Given the grandeur and diversity of Oregon's flora, why would anyone choose to highlight a lowly grass? Oregon has its pitcher plants, lilies, a plethora of endemic milkvetches, and enough truly spectacular plants to knock the socks off any botanist. Why a grass, and a little one at that?

But, I offer no apology. To paraphrase Aldo Leopold, and his oft-quoted verse paying homage to *Draba verna*, Sandberg bluegrass is a small plant that does its job well. It's not flashy. There are no societies it can call its own. Its visage will likely never appear on the cover of a magazine. Sandberg bluegrass just goes about quietly doing its job, and for that, it deserves recognition.

Taxonomy: It's Complicated

First, there must be a common understanding as to the true identity of this subject plant. The current, generally accepted name is *Poa secunda* J. Presl, otherwise known as Sandberg bluegrass (USDA 2011). Other common names are one-sided bluegrass and secund bluegrass. Also, please note that to most it is known as Sandberg bluegrass, not Sandberg's.

This plant, at one time known as *Poa sandbergii*, was named after Swedish botanist J. H. Sandberg, who collected it near Lewiston, Idaho, in 1892. Between 1886 and 1893 Sandberg worked for the U.S. Dept. of Agriculture collecting plants in the western US, including Idaho and Washington (HUH 2011). In 1893 he assisted John Leiberg in a plant inventory of the Columbia Basin in Washington (Walker 2000).



A typical Sandberg bluegrass plant, pre-anthesis. Purplish tinted spikelets arise from a short tuft of basal leaves. Photo from above the North Fork of the Crooked River, Crook County, taken May 7, 2010 by Ron Halvorson.

Wait. If it was once known as *Poa sandbergii,* why is it now *P. secunda*? This is a good time to talk about type specimens.

In botany (and zoology), every species name is based upon one particular specimen – the "reference" specimen upon which the scientific description is written. Since different people may have unwittingly collected and described the same plant at different times and from different geographic locations, it's normal to have more than one name published for the same taxon. As time goes on, these synonyms are discovered. What then? What is the real name of a species in question when there are several seemingly correct names in common usage?

The basic rule established by the International Code of Botanical Nomenclature (ICBN) is that the earliest published name trumps all other names, and the collection upon which that name is based is called the type specimen. As long as taxonomists strive to understand the status of species, synonyms will continue to be exposed and renamed, and this is why the name of our subject bluegrass has changed from time to time.

Sandberg's collection in 1892 (*Poa sandbergii*) was predated by an 1806 collection made in Idaho by Merriwether Lewis (Reveal 2001). This collection became known as *Poa canbyi*. However, there was an even earlier collection in 1790 by Bohemian botanist and South American Naturalist Thaddaus Haenke (1761-1817), from the "mountains of Chile." Some question the origin of this type, thinking that it could actually be from California (MBG 2011). Nevertheless, it was this collection that another Bohemian botanist Jan Svatopluk Presl (1791-1849) used to describe *Poa secunda* in 1830. This is the earliest published name and is why Sandberg bluegrass is *Poa secunda*, at least for now.

This is where it gets even more interesting.

Back in the day, as a young, impressionable range conservationist with the Bureau of Land Management, I made it my responsibility to know the vegetation I was working with. I distinctly remember trying to key out a mid-sized bunchgrass with the old *Manual of the Higher Plants of Oregon* by Morton Peck. I couldn't get it to go to anything but *Poa secunda*, even though it was twice the size of the little plants I knew and loved. I finally decided that it was a Sandberg bluegrass on steroids.

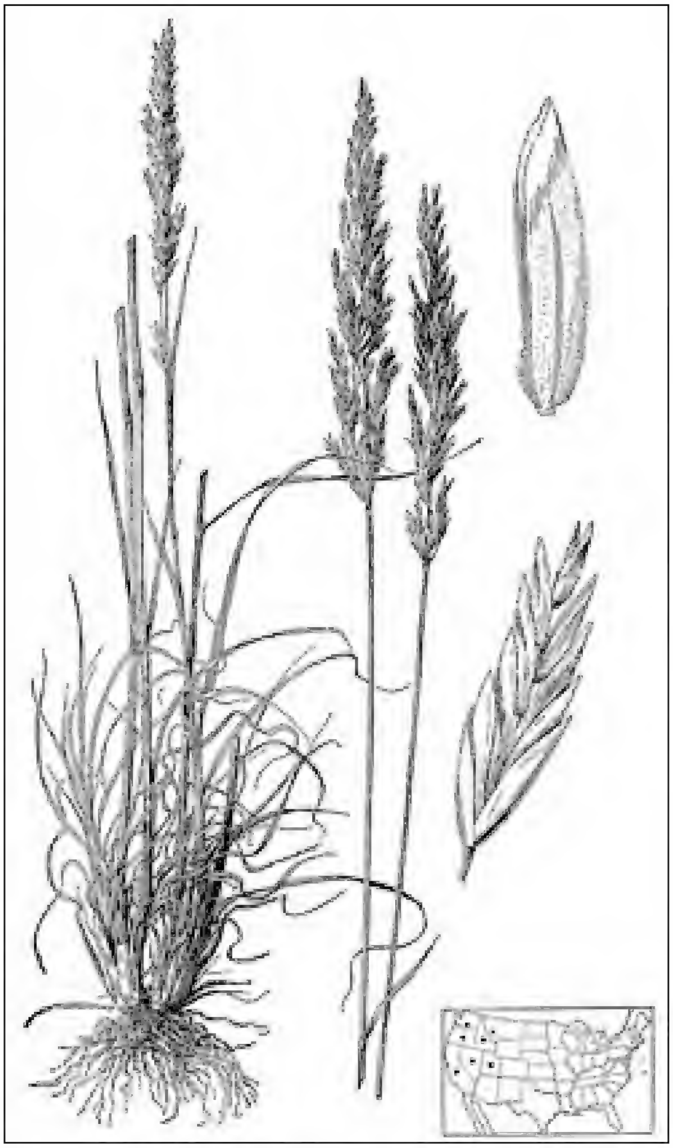
Before long, I became aware of other, similar bluegrasses that called central Oregon home, including pine bluegrass (*Poa scabrella*), Canby's bluegrass (*P. canbyi*), Nevada bluegrass (*P. nevadensis*), alkali bluegrass (*P. juncifolia*), slender bluegrass (*P. gracillima*), and big bluegrass (*P. ampla*). This was all well and good, but it was of little help to me. The floras seemed so ambiguous I never really knew what I had in hand. Once in a while I was sure of a pine or alkali bluegrass, but that was about it.

It turns out I was not alone.

When the topic is *Poa secunda*, terms such as "highly variable" (Rawlins 2006) and "phase of this complex species" (Reveal 2001) abound in the literature. Even former Oregonian Robert Soreng, now a noted authority on grasses at the US National Herbarium, calls Sandberg bluegrass "a wickedly complex species" (Soreng, pers. comm., 2011). Up to 45 different species have been described within this complex at one time or another (Ceska 2005).

The source of the confusion is that Sandberg bluegrass produces seed both sexually and asexually (without pollination). Sandberg bluegrass normally reproduces by apomixis, the asexual breeding system (Howard 1997), but it outcrosses often enough to create new variations that are uniform not only morphologically but ecologically (Wilson, pers. comm.). Many of these variants have been treated as species in the past, but in reality, intermediates can be found between all of them (Wilson, pers. comm.). Hence, it's often impossible to tell exactly what you have.

As a result, many taxonomists have synonymized (lumped) several heretofore separate taxa into one: *Poa secunda*. Some current treatments further separate *P. secunda* into two morphologically different forms, subsp. *juncifolia* and subsp. *secunda*. Although this seems like radical new work to many botanists (for some, blasphemy), it has been in process for nearly 60 years (Soreng, pers. comm.), and is the tack taken in the upcoming Flora of Oregon (Wilson, pers. comm.). In the splitter's camp, some maintain that unique phenotypes exist and that they should remain separate to help define ecological sites, to predict the performance of revegetation efforts, and to assist in making other land management decisions (Tilley *et al.* 2011).



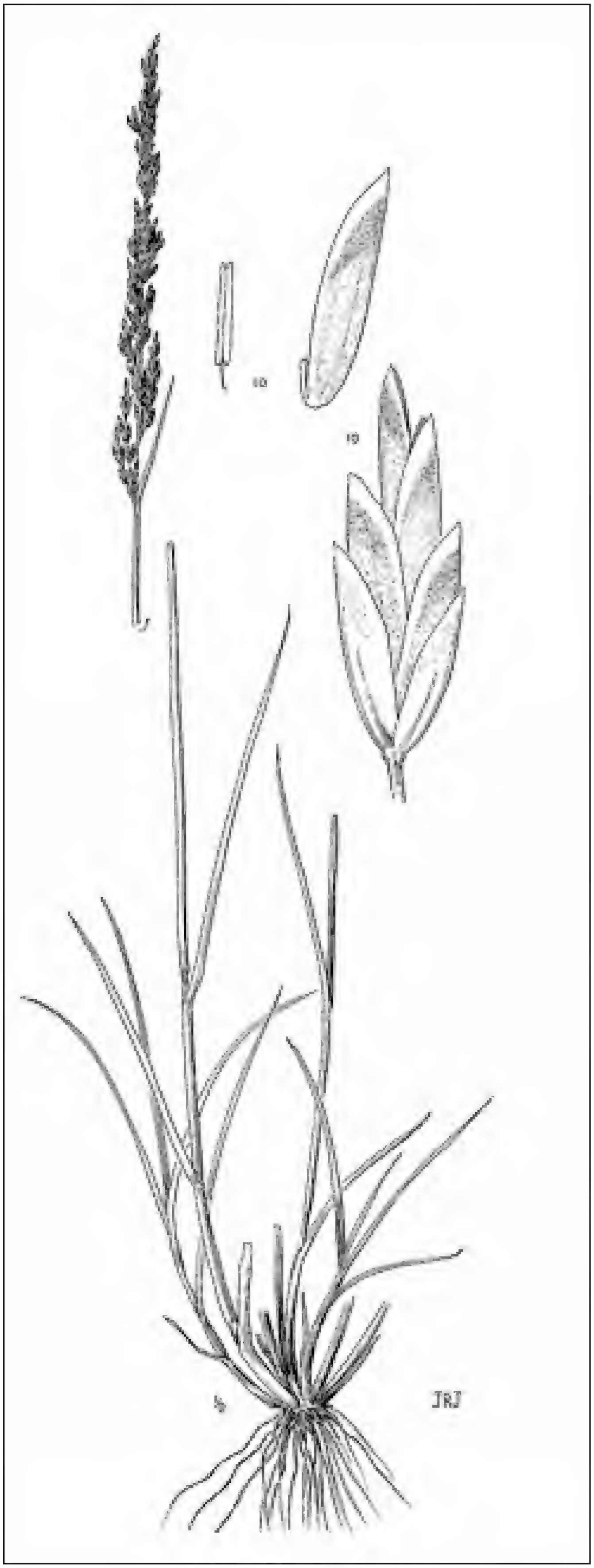
Line drawing of Sandberg bluegrass by Agnes Chase that appeared in A.S. Hitchcock's *Manual of the Grasses of the United States*, as *Poa scabrella*, which is now a synonym for *Poa secunda* subsp. *secunda*.

In the Flora of Oregon, *Poa secunda* ssp. *juncifolia* will include the more robust variants, which usually occupy moister and sometimes more saline habitats than ssp. *secunda*. In Oregon, this includes the former *P. ampla* (big bluegrass), *P. juncifolia* (alkali bluegrass) and *P. nevadensis* (Nevada bluegrass) as some of the synonyms.

Those who were able to successfully separate *P. canbyi* (Canby's bluegrass), *P. gracillima* (Pacific bluegrass), *P. sandbergii* (Sandberg bluegrass) and *P. scabrella* (pine bluegrass) will have to be content with calling all of them *P. secunda* ssp. *secunda*. These are the mostly shorter plants found in the drier, more upland sites.

To summarize: a *Poa* by any other name is *secunda*, and some of us are thankful.

Note: Although the subject of this paper is *Poa secunda* in its broadest sense, please be aware that this author's experience has been mostly limited to the arid lands east of the Cascade



Nevada bluegrass (*Poa nevadensis*) has been submerged into *Poa secunda* subsp. *juncifolia*. Illustration by Jeanne R. Janish from *Vascular Plants of the Pacific Northwest*, used by permission from the University of Washington Press.

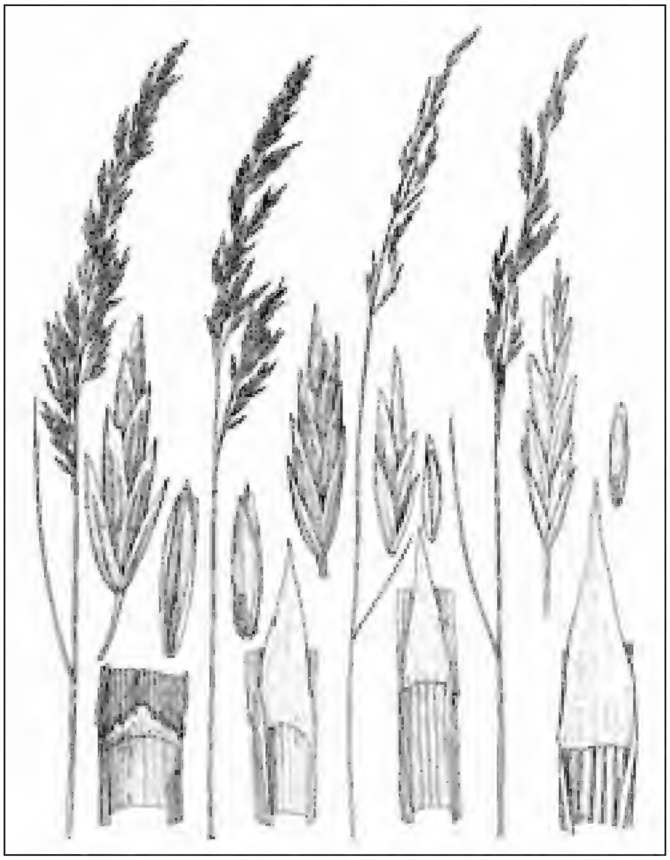
Mountains in Oregon. Therefore, portions of the discussion, either intentionally or unintentionally, will tend to favor the smaller members of ssp. *secunda*.

Distinguishing Characters

Sandberg bluegrass is a cool-season, perennial bunchgrass, growing from 6 to 48 inches tall. The basal leaves are in tiny to robust tufts up to 8 inches tall and up to 12 inches in diameter. The leaf blades are somewhat narrow, usually no wider than ¼ inch and can be flat, folded, or rounded, soon-withering or persisting after maturity. There are usually up to two flowering stems per plant, with narrow, erect, usually contracted inflorescences that are short, but can be as long as 10 inches. The inflorescences open somewhat during anthesis (flowering), and can contain more than 100 spikelets. The spikelets are often purple tinged, and the entire plant acquires a reddish coloration as it ages (see photo inside back cover).

A Cosmopolitan Species, Both Geographically and Ecologically

In North America, *Poa secunda* occurs from southeastern Alaska across southern Canada as far as the Gaspe Peninsula, and then south through the western and Great Plains states to northwest Mexico. Widely disjunct populations also occur in Chile and Argentina, but it is infrequent there (Soreng, pers. comm.).



The USDA Agricultural Research Service looked to the Sandberg bluegrass complex for grasses to stabilize soil and provide wildlife cover. From left to right, Sherman big bluegrass, Canby bluegrass, Sandberg bluegrass, and Nevada bluegrass. Illustration by Lucretia B. Hamilton, published in USDA SCS Agriculture Handbook No. 339 (1968).

Its ecological breadth rivals its geographical one. It can be found in saline and alkaline meadows, chaparral, foothill woodland, grasslands, sagebrush scrub, dry meadows, and even in sub-alpine situations up to 12,500 ft. in elevation, where annual precipitation averages 8 to 20 inches. Soils vary from rich clays and loams to harsh sands, serpentines, and scablands. Within the United States, it can be found in 16 BLM physiographic regions, more than 20 ecoregions, 80 rangeland cover types, and 33 SAF cover types (Howard 1997, Stannard 2005, Hogan 2010, Ceska 2005).

In Oregon, Sandberg bluegrass has been documented from a variety of sites ranging from near sea level to alpine (9,800 ft. elevation), including dry, rocky ridges, bottomland, damp meadows, spruce forest, grassland, sagebrush, western juniper, ponderosa pine, alpine ridges and slopes. Although more common east of the Cascades, it is claimed by all but six Oregon counties: Columbia, Lincoln, Polk, Tillamook, Washington and Yamhill. Clatsop County escaped this northwestern cluster since Sandberg bluegrass has been documented from Saddle and Sugarloaf mountains (OFP 2011).

In eastern Oregon, Sandberg bluegrass is the characteristic grass of the scablands, whose rocky, shallow soil is usually dominated by stiff sagebrush (*Artemisia rigida*), but it occurs in many other situations as well. Data collected as part of the BLM's Ecological Site Inventory shows that Sandberg bluegrass is not just the most common grass, but it is the most common plant (highest frequency) recorded during many years of survey in eastern Oregon (Horn, pers. comm., 2008).

A Year in the Life of a Sandberg Bluegrass Plant

In eastern Oregon, where Sandberg bluegrass is most common, you can tell spring has arrived where you see those little clumps of grass beginning to green on the otherwise brown hillsides of winter. This grass is one of the first native plants to start growing (Stannard 2005), taking advantage of the early moisture and favorable temperatures of early March. Of course, the timing of all phenological stages varies by habitat, elevation, and other factors.

Soils dry quickly in eastern Oregon, so Sandberg bluegrass must complete its reproductive cycle in short order. By May it has flowered and perhaps set seed. In most years, a significant amount of seed is produced; about half of it viable (Howard 1997). By late June, after it has colored its surroundings with a decidedly-reddish tint, all that remains is a sad, dry, little tuft of brittle leaves. Now it waits.

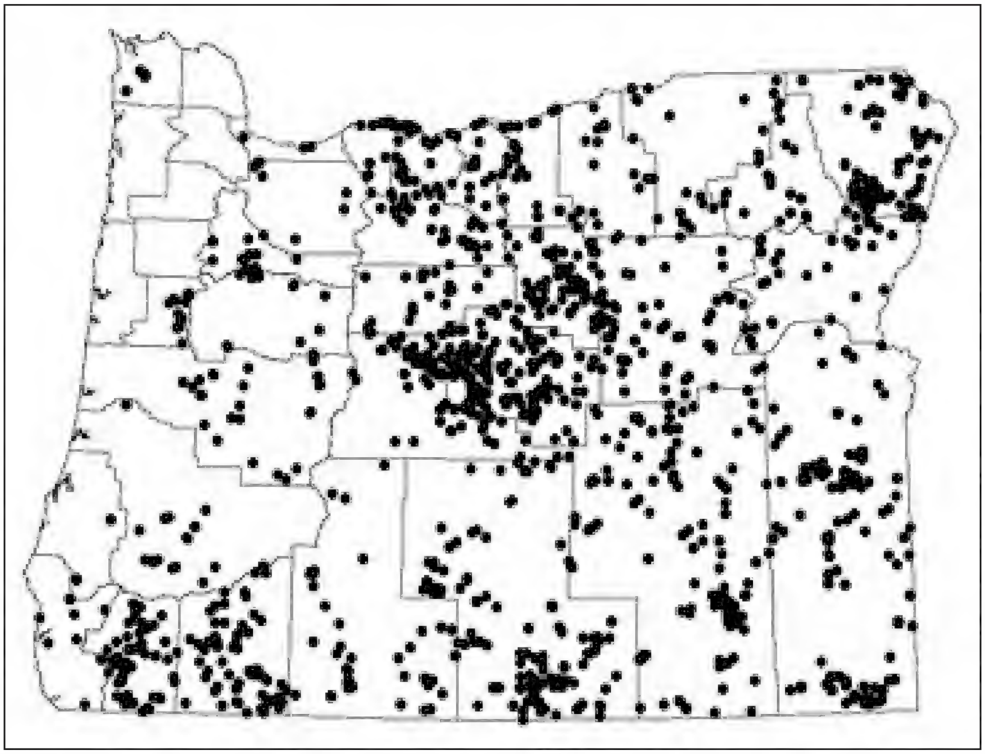
While most perennial grasses east of the Cascades lie dormant throughout the fall and winter until the following spring, Sandberg bluegrass revives after the first fall rains. They don't have to be soaking rains (light showers will do) and the leaves begin new growth almost immediately. Sandberg bluegrass will actively grow throughout October and November until winter sets in and daytime temperatures are too low. Along with April and May, midwinter is a period of maximum leaf height for *Poa secunda* (Howard 1997).

Response to Disturbance and Competition

Plants of the Sandberg bluegrass complex have extensive, deep penetrating, coarse, fibrous roots that make them drought tolerant and resistant to grazing and trampling, and hence, fairly resilient to disturbance (Tilley *et al.* 2011). Most of the work done in this respect has been within sagebrush steppe communities, and here, due to its low stature and root structure, *Poa secunda* persists in spite of past grazing practices (Stannard 2005). Early on it was noted that on the "public domain" lands of the West, overgrazing had killed out most of the native bunchgrasses except for Sandberg bluegrass (USDA 1937).

Sandberg bluegrass is not harmed by fire and generally increases in response to wildfire, in part because it usually is completely dormant when most fires occur (Howard 1997). In one study of the effects of a spring fire, although Sandberg bluegrass didn't resprout the first season after burning, by the second it had, even increasing in size and vigor (Rau *et al.* 2008).

While it tends to persist with fire and/or grazing, Sandberg bluegrass is not shade tolerant. It normally occurs in open sun to partial shade, and where fire is absent, it may be shaded out by sagebrush. It's also likely that it can be shaded out in any plant community in which it occurs, such as in open forestland (Howard 1997).



Distribution of *Poa secunda* in Oregon, including both observations and specimens. Map courtesy of the Oregon Flora Project Plant Atlas, 2011.

In some habitats Sandberg bluegrass is considered an early-successional species that tolerates some of the disturbances that eliminate larger bunchgrasses, and has the ability to compete with some of the exotic annuals, such as cheatgrass (*Bromus tectorum*) (Davies and Svejcar 2008). One advantage may be that the phenology of its growth is similar to that of cheatgrass: starting early and maturing quickly. After fire, it can outcompete cheatgrass, at least for a time (USU 2010).

One would think this would hold true for another vigorous exotic competitor, medusahead (*Taeniatherum caput-medusae*). Similar to cheatgrass, this species starts and matures early. However, medusahead invasion has been shown to actually reduce the cover and density of Sandberg bluegrass as much or more than the larger bunchgrasses. Additionally, if a thatch of dead medusahead builds up (its high silica content resists decomposition), there could be a shading effect on Sandberg bluegrass as well (Davies 2008).

In Praise of Our Bluegrass

All plants have their place, and Sandberg bluegrass is no exception. From a forage standpoint, for both livestock and wildlife, it ranks among the most important of range grasses (USDA 1937). It is drought tolerant and persists, regardless of annual weather patterns (Howard 1997). As one of the first grasses to mature, it provides an early source of protein for grazing animals, but its palatability is soon reduced. A crude protein (CP) content of 24% is common during its period of lush growth, but by the end of June, it can be as low as 5% (Bedell 2008). However, in the late fall and winter, when other native species are at their protein-lowest, Sandberg bluegrass can have a CP content of up to 16%, after it re-greens following fall precipitation (Ganskopp and Bohnert 2001), and is a choice winter forage for elk. The taller forms of *Poa secunda*, segregated as ssp. *juncifolia*, tend to mature later and produce more usable forage later in the season.

Commercial strains of subspecies *juncifolia* have been developed for erosion control and soil stabilization. Through federal breeding programs, the native big bluegrass type of Sandberg bluegrass has been released as several cultivars. "Sherman" big bluegrass has been in use in the Pacific Northwest for decades. Originally collected from near Moro, Oregon, in 1932, it was released to the public in 1945. Since then, it has been used extensively for soil conservation, livestock forage, and wildlife habitat, including upland game bird nesting (USDA-NRCS undated). Another popular cultivar is "Canbar," genetic offspring from Canby bluegrass. It serves a similar niche as "Sherman," but does well in higher precipitation zones (Tilley *et al.* 2011). Alaska has even gotten in on the act with its 1989 release of "Service" big bluegrass, named after Robert W. Service, famous "bard of the Yukon." Like the others, it is useful for erosion control, revegetation and other landscape projects (Hunt and Wright 2007). Even those forms within *P. secunda* ssp. *secunda*, although smaller, are used in restoration projects as part of native seed mixes (Tilley *et al.* 2011).

It's interesting to note that researchers from the 1930s to the 1950s studied *Poa secunda* extensively with the hope of breeding a super grass. Their plan was to use apomixis to fix variations, and then they would select the hardiest of them, hoping for a variety that would breed true. Lots of hybrids were produced, but none became the sought-after super grass (Soreng, pers. comm.).

Locally, Sandberg bluegrass performs a unique and important function: habitat for the rare woven-spore lichen (*Texosporium sancti-jacobi*). Found at only a handful of locations in Washington, Oregon, California and Idaho, this lichen depends on organic matter as its substrate, and mainly grows on dead clumps of *Poa secunda*, along with small mammal dung (CWNP 2010).

Given its diminutive stature, short leaves, and relatively small seed, it would be understandable that Sandberg bluegrass would have had minimal value as an ethnobotanical resource. However, there is one report that its seeds were used for food by the Goshute Indians, a tribe of the Shoshone nation in the Great Basin (Chamberlin 1911).

Conclusion

Sandberg bluegrass is a vital member of Oregon's native flora. It's a tough little tussock and serves as the native bunchgrasses' last line of defense against

Poa secunda has periods of active leaf growth even during late fall and early winter. Photo taken November 25, 2010, at Ochoco Viewpoint State Park, Crook County, Oregon, by Ron Halvorson.

exotic annuals. It also fills an important niche of providing early- and late-season protein for grazing animals, and its cultivars have been used successfully in revegetation and restoration efforts for more than 60 years.

A dense stand of flowering *Poa secunda* is a wonder to behold, even if you have to get down on your hands and knees to appreciate it.

Acknowledgements

I would like to thank Ed Horn, a recently-retired soil scientist from the Bureau of Land Management, for a conversation we had in 2008. Ed spent the majority of his long career conducting soil and vegetation inventories throughout central and eastern Oregon. He came to me one day and asked, “I bet you can't guess the most common plant in all of our surveys?” The answer: Sandberg bluegrass. His comment provided the inspiration for choosing *Poa secunda* as the subject for this article in the first place. Second, Robert Soreng, of the National Museum of Natural History at the Smithsonian, and an expert in the *Poa secunda* complex, provided great insight into the complexities of this little plant, as well as some pertinent taxonomic history. I hope he never figured out that I didn't know what I was doing. Finally, Barbara Wilson who, with the Carex Working Group, is responsible for the Poaceae treatment in the upcoming Flora of Oregon, provided a current description of Sandberg bluegrass and helped to make sense of the reasons this grass is so complex.

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Lucia Summers (1835-1898):
First Resident Botanist in the Pacific Northwest

Edward R. Alverson
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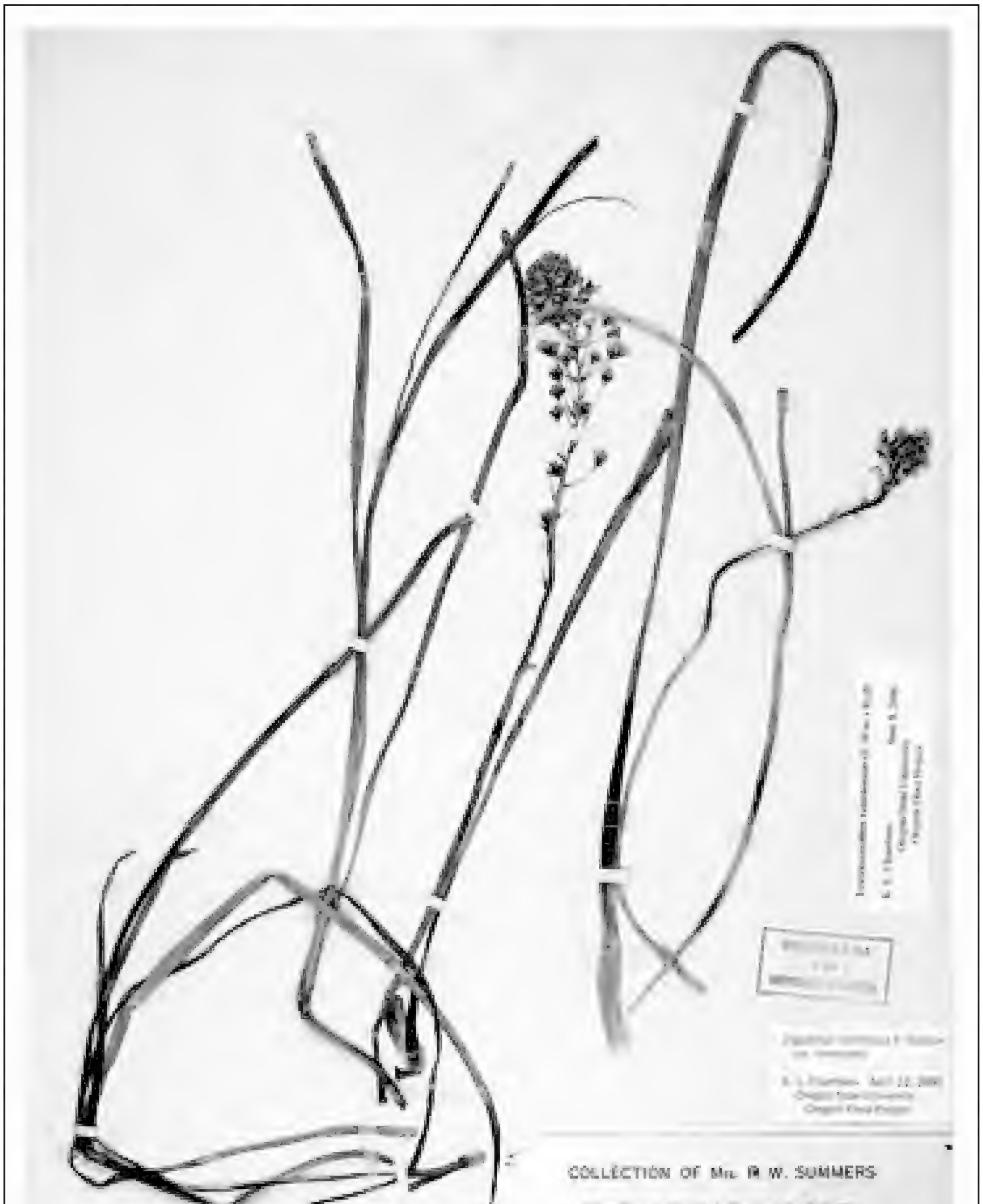
Lucia Summers was a pioneer botanist in the Pacific Coast states between 1871 and 1898. She experienced the Northwest landscape as it was just beginning to be altered by the first generation of European settlers. When she arrived in Seattle with her husband, the Rev. Robert W. Summers (the first Episcopal priest in Seattle), it had been a mere 17 years since the arrival of the first permanent European settlers. Seattle of 1871 was little more than a village of about 1500 inhabitants. Lucia was well educated, and an accomplished linguist and musician, when she arrived in Seattle at the age of 34. After three years in Seattle, the Summers moved to McMinnville, Oregon, where they lived until 1881. In Oregon, she traveled extensively with her husband, collecting both bryophytes and vascular plants. In that era there were no herbaria in the region, so she sent her specimens to botanists at Eastern herbaria. Consequently, her role as a pioneer resident botanist is not well known to present-day Northwest botanists. However, her experiences were remarkable. Once, she traded the dress off her back to a Native American woman in exchange for a shell necklace and beaver charm.



Herbarium specimen of death camas (*Toxicoscordion venenosum*) collected by Lucia Summers in Yamhill County, Oregon, in 1873. This is one of the oldest collections from Oregon in the Oregon State University Herbarium. Image courtesy of OSU Herbarium.

Born in Vermont, Married in Missouri

Lucia's given name was Susan Ann Noyes, and she was born in Hartland, Vermont, on November 22, 1835, the older daughter of Benjamin Noyes and Julia Ann Bartlett. Her nickname Lucia was probably in honor of her father's first wife, who died in 1831. Lucia had one sibling, a sister, Lavinia, who was born in 1839 (Noyes 1904). Lucia's father Benjamin was listed in the 1860 census as a "master carpenter," with a combined value of real estate and personal property of $2900, a considerable amount at that time. The Noyes were a long established New England family, and sufficiently affluent for Lucia to receive an advanced education, unusual for women at that time.

Some time during the 1850s, Lucia's family moved from Vermont to Hannibal, Missouri, where she met her future husband, Robert William Summers. They were married there on July 17, 1859. Hannibal, of course, is the river town along the Mississippi that was the childhood home of Samuel Clemens (Mark Twain).

Robert's Origins

Robert Summers was born in 1827 in Madison County, Kentucky, the son of John Summers, an officer in the U.S. Army who had distinguished himself in the "Indian wars" of the west. Perhaps it was hearing stories of his father's experiences on the frontier that was the source of Robert's life-long interest in Indian culture and artifacts. Robert's family had been long established in the New World; his obituary stated that he was descended from Sir George Somers, part of a group of Virginia colonists who were shipwrecked on Bermuda in 1609. Sir George's published account of their experience was the source of the plot of William Shakespeare's play, "The Tempest."

As a young adult, Robert Summers undertook a brief tenure as a homesteader in Oregon's Willamette Valley. He established a claim in 1853 in the Eola Hills, in northern Polk County between Salem and McMinnville (Cawley 1995). Cawley's biography speculated that Summers emigrated to Oregon because he was a distant relative of the Applegate family. Barely two years later, in early 1855, he sold his claim and moved back east, indicating that perhaps he was not cut out to be a farmer.

Early Married Years

We know only a little about Lucia and Robert's activities and whereabouts between 1859 (when they married) and 1870. Apparently, the couple spent at least part of that decade touring Europe, and in 1867 Robert was ordained as a minister in Kentucky. In the 1870 census the couple was recorded as living in Frankfort, Kentucky. Three children were listed as members of their household: Nettie Watson, William Clark, and a three-year-old girl who also bore the name of Lucia Summers. The first two were possibly a niece and a nephew, the third was likely their own child. The fates of these three children are not known, but only one year later, when the Summers arrived in Seattle, they were childless. Probably all three were lost to an illness or some other type of tragedy that commonly befell children in the 19th Century.

Snoqualmie Falls is still a popular tourist attraction, and is an impressive spectacle when the river is running high. Photo by Ed Alverson.

West to Frontier Seattle!

Robert assumed the duties of minister in the Seattle Episcopal Church in 1871 and the Summers lived in the Pacific Northwest for the next ten years. They remained on the west coast for the remainder of their lives. Robert and Lucia made a striking, and in some ways, peculiar couple. One of his parishioners in Seattle described the couple: "He was not a young man and his hair, which was gray, hung in long curls to his shoulders. He wore a beard and was very patriarchal and dignified looking...Mrs. Summers was also very peculiar in her dress and manner. She had lived for some time abroad, and was a fine musician and linguist. She taught music and drawing. Both she and Mr. Summers were very fond of nature, and loved to collect insects, lizards, etc., from the woods, where they spent a good deal of time." Furthermore, while the Summers were "very charming and cultivated people, they were a little antiquated and they lacked the force necessary for so thriving a place [as Seattle]" (Jessett 1948). One gets the impression that both Robert and Lucia viewed the world through the eyes of the artists and philosophers of the Romantic Period of the early 1800s, and as such were out of place in the era of the Industrial Revolution.

Our knowledge of the Summers' explorations in Washington and Oregon primarily comes from a set of copybooks that Robert Summers compiled just prior to his death. The copy books contain a mixture of daily journal entries and undated reminiscences, touching on places visited, encounters with Indians, anthropological notes, and natural history observations. These copybooks have been organized and edited by Robert Cawley and published as "The Indian Journals of R.W. Summers." In the journals, Robert refers to Lucia in the third person, as "The Artist," or "The Botanist," as in this description of a visit to Snoqualmie Falls, east of Seattle, in July 1873. The words are Robert's, but they certainly would describe Lucia's experience as well:

> *"As the road hither from Seattle is not practicable for wheels, we have made the trip with horses only, up and down steep hills, through unbroken cone forests and then across the small plain known as Snowqualmie Prairie, until we find ourselves camped where road and water meet, two miles above the falls of the river... We started down the great river in a canoe, with two Indians paddling. They sat perfectly quiet and dipped their paddles in silence, as the road ahead became louder and the rush of the current more overwhelming every moment... After a time...the deafening roar was coming very near and the awful leap of a whole great river was just ahead... Then a quiet, not unmusical Indian voice said "shall we go ashore on that rock?" In an instant we were standing on a flat ledge that sloped downward just a little into the quiet eddy, as if made on purpose for a landing. As we walked on we obtained, from the top of the wooded bank, a view of the whole scene, and lo! we were but a few rods above the magnificent falls! With one sheer leap the powerful mass of water landed itself in a circular basin nearly 300 feet below us; a basin whose walls were everywhere perpendicular rock and, in some places, overhanging; perpendicular save where the outlet of the river cut through, its further progress toward the sea ...Some of us cut branches for a wildwood booth over our Artist, for the July sun was seething in its heat. And then, by sliding down fallen trees and leaping down rocks, we succeeded in reaching the level of the basin below...It took us the rest of the afternoon, by a long circuitous route, to reach camp again...our Indians were ready at the appointed time to paddle our canoe up the river again and, taking with us several rare species of moss, as souvenirs, we bade the grand, secluded, mountain-and-water scene goodbye forever, with a sigh"* (Cawley 1995).

A New Parish in McMinnville, Oregon

Although Robert's term as parish priest in Seattle was initially successful, church membership declined after a few years, and he seemed to have fallen out of favor among the church community. Perhaps his interest in natural and cultural history was stronger than his interest in building the church as an institution. Cawley (1995) has much more to say about these details of church history. Whatever the reason, Robert and Lucia found themselves reassigned in 1873 to the Episcopal Parish in McMinnville, Oregon, where they made their home until 1881. This was a homecoming of sorts for Robert, since he had homesteaded in the nearby Eola Hills nearly 20 years earlier.

Robert Summers was the minister at St. James Episcopal Church, later named St. Barnabas Episcopal Church, in McMinnville. The church building, which stood at 5th and Davis Streets, was torn down in 1964. Image courtesy of St. Barnabas Episcopal Church, McMinnville.

The Summers's eight years in McMinnville were undoubtedly filled with the duties of a parish priest and his wife, but these daily activities are scarcely documented. It is known that Robert and Lucia designed and supervised construction of the parish church, which stood on the corner of Fifth and Davis Streets in McMinnville until it was removed in 1964.

Lucia Connects with the American Botanical Community

The oldest of Lucia's surviving botanical collections date from the time of the Summers' residence in Oregon. Surviving correspondence between Lucia and Daniel Cady Eaton, Professor of Botany at Yale University, provide insight in to Lucia's increasing activity as a collector and supplier of natural history specimens to both professional and amateur naturalists in the eastern United States:

> *McMinnville, Oregon*
> *Sept. 7th 1874*
> *To Prof. D.C. Eaton,*
> *Dear Sir,*
>
> *In the California Horticulturist for January of last year I have just finished reading over again an article from your pen on collecting Algae. At its close is this announcement: "It remains only to add that the writer of these notes will receive with thanks any collections, large or small, from all parts of the world, & will endeavor to name all American specimens sent to him, if so decided".*
>
> *Does this offer still remain open? I have a small collection of them, very small, from Puget Sound & Tillamook Bay & Sandwich Is., rough dried. There is also a sponge among them, & a coralline or two. I should be most happy to have these named, if I send a suite to your address can you return me their names? I am collecting plants also, & would like to furnish someone a suite for the names. Can you give me the address of any botanist who will do this?*
>
> *Being the wife of a very busy missionary, whom I assist in many ways, I have not the time for these studies that I once had. My husband, Rev. R.W. Summers, having given over to my care his beautiful cabinet of geology & natural history; but most of the plants in my herbarium of Oregon and W.T. I have a written analysis of, prepared by careful microscopic examination. Any such information of difficult or unknown plants I can furnish from my notebooks.*
>
> *Hoping a favorable reply*
> *I am Yours Truly*
> *Lucia Summers*
> *McMinnville Oregon*

Professor Eaton's response, we assume, was encouraging, and thus began a long correspondence that provided Eaton with specimens from a poorly botanized region of the country, and Lucia Summers

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) is listed as a threatened species by the US Fish and Wildlife Service, and still survives in a few prairie remnants and on roadsides in Yamhill County. It is the food plant for the larvae of the endangered Fenders' Blue Butterfly. Photo by Ed Alverson/TNC.

Mule's ears (*Wyethia angustifolia*) still survives in a prairie remnant on The Nature Conservancy's Yamhill Oaks Preserve west of McMinnville. Lucia's specimen of *Wyethia* helped Robert and the Indian Poyusah determine the identity of the plant whose seeds Poyusah hoped to use to heal his friend. This flower is being visited by a Valley Checkerspot butterfly, which itself has become quite uncommon in the Willamette Valley. Photo by Ed Alverson/TNC.

with a connection to the American botanical community.

At one point in their correspondence, Eaton apparently shared news that one of Lucia's moss specimens had been determined as a new species, and would be designated with the epithet *Hypnum summersae*. This news threw Lucia into a flight of fanciful writing, as follows from a letter dated January 20, 1879:

> *Your very kind letter reached me two or three weeks since, & gave great pleasure to both Mr. Summers and myself. The naming of the new moss,* Hypnum summersae, *for the honor of which name we consider ourselves primarily indebted to you, lays us under deep obligations of gratitude, & we hope you will accept the sincerest thanks of both. That my name should thus be made one of earth's enduring things in this way is what I have sometimes dreamed of, but really never entertained as so much as a wish, till the receipt of your last letter. There are so many men in every dep. of botany, - so many who have visited this region in special pursuance of their special science, that it seemed impossible that one who falls so far below them should ever be happy in new discoveries. I have often said to myself in the last two or three weeks that one of God's works was called after my name; & have looked at the tiny, shining plant as if it had in some way named me, as priestess in the kingdom of nature. I would rather be thus associated with the works of the Great Creator, than with the noblest and the best that can come from the hand of mortals. I shall be very happy to see a description of it, whenever you shall have leisure to publish it, as you mention. I have delayed sending away any till the present time, but this month shall begin to do so, as several collectors have asked for it. I am much obliged for the names of my plants contained in your pages. It is a most agreeable thing, when setting a name down, to feel sure it is right.*

Unfortunately, Lucia's hopes were dashed in a letter that arrived a few weeks later, for her next letter to Eaton, on April 1, 1879, began with the following entry:

> *Your letters of Feb 5th and 6th arrived safely in McMinnville a number of days since, & were read with much gratification. I regret the mistake about the Hypnum summersae, which seems to be no H. sum--- but Antitrichia curtipendula, var. It seems very odd that one like Dr. Schimper should commit such an error, but only proves that human judgement, however great, is still fallible.*

Traded the Dress Off Her Back

Robert's journals describe a variety of excursions around Oregon between 1873 and 1881, including local outings around Yamhill County, multiple trips through the coastal mountains to the Oregon Coast, and even an extended expedition to the Klamath Indian Reservation in June of 1876. Lucia's few existing plant collections at the Oregon State University herbarium also document these travels, as they come from Yamhill County (McMinnville), Lincoln County (Yaquina), Tillamook County ("Coast Mountains"), and Douglas County (Roseburg). This suggests that Lucia was present on many, if not all, of Robert's excursions around Oregon. One of the oldest of her collections in the Oregon State University Herbarium is a specimen of death camas, *Toxicoscordion venenosum* (S. Watson) Rydb. (syn. *Zigadenus venenosus*), collected in Yamhill County in 1873. That this is a poisonous species similar to the important edible common camas (*Camassia quamash*) suggests a connection between Lucia's botanical collections and Robert's interest in ethnography and Indian artifacts.

Robert's journal describes an episode that involved Lucia's personal herbarium. On April 30, 1876, the Summers were visited at their home by a group of Indians from Grand Ronde, including Poyusah, with whom they were acquainted from earlier visits to the Reservation. A friend of theirs was ill, and they had brought a small quantity of seed of a yellow-flowered composite that they hoped to grind into meal using a mortar and pestle from Robert's collection of Indian artifacts. Apparently the Indians felt that eating the ground seed would help their ill friend. According to Robert's journal,

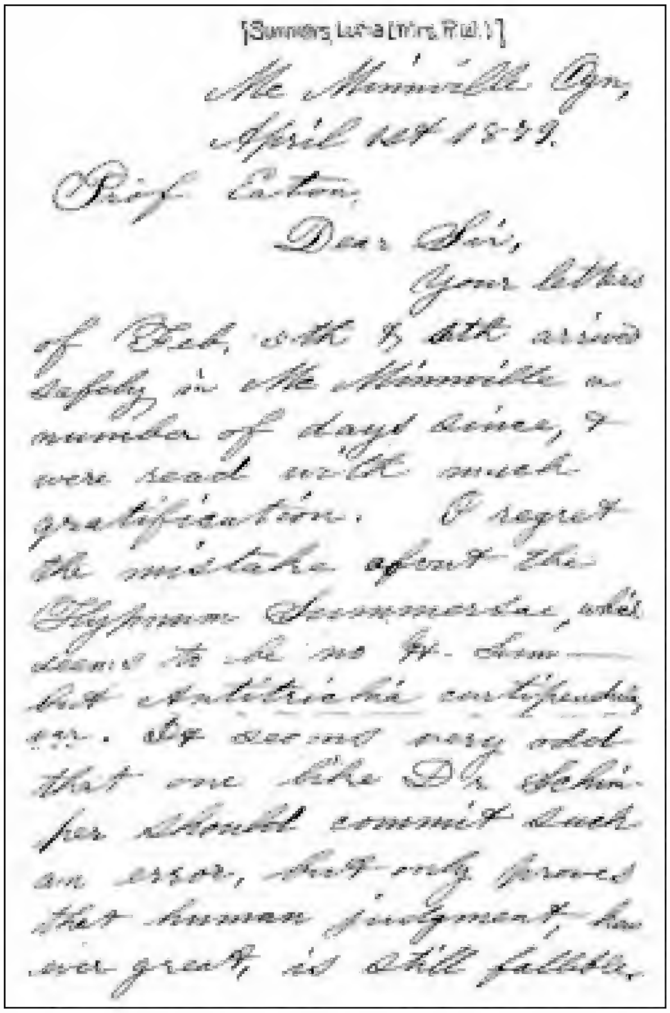
> *"…to identify the plant they had brought, I showed him (Poyusah) specimens of various dried plants with golden flowers. He at once picked out a sunflower and said their plant was like that in color and growth. Theirs, however, was 'a little flower, and the sunflower seeds were much larger, but by-and-by their flower would be full of them. Then, when it was ripe, the Indians would pick the head off it and turn it upside down and shook [sic] the seeds out.' All this he illustrated as he went along, having my dried* Wyethia *in his hand. I judged the seed was a* Madia.*"* (Cawley 1995).

Robert and Lucia's 1876 trip to the Klamath Indian Reservation in southern Oregon was their longest journey during their residence in the Pacific Northwest, lasting from late May through late July. Cawley (1995) speculates that Robert was invited to Fort Klamath to provide a clerical presence for their celebration of the 1876 US Centennial. Whatever the justification, the Summers turned the trip into an extended natural history collecting expedition. An entry in Robert's journal from July 13th, soon after they began the return leg of the journey, describes their caravan:

> *"The head of an antelope is brought to me today, which I add to the horns of two deer shot by us on this trip and the large head of a mule deer obtained from Mr. Dyer. Our carriage is beginning to assume quite the aspect of a naturalist's, for we have tied on to its outside not only these horns but also the great cones of the Cascade needle trees. And inside we have stowed all the things preserved in cans of alcohol, and of course, the flowers in their presses."* (Cawley 1995).

These journal entries were apparently written following their return to McMinnville, for the entries contain the names

The Summers undoubtedly would have spent time in Gopher Valley, west of McMinnville, in the late 1800's. While the landscape has changed and the native prairie flora has been greatly reduced, The Nature Conservancy's Yamhill Oaks Preserve still supports remnants of native prairie vegetation, including Kincaid's lupine, which blooms in late May and early June. Photo by Ed Alverson/TNC.



[Summers, Lucia (Mrs. R.W.)]

McMinnville Ogn,
April 1st 1879.
Prof. Eaton,
Dear Sir,
Your letters of Feb. 5th & 8th arrived safely in McMinnville a number of days since, & were read with much gratification. I regret the mistake about the Hypnum Summersiae, which seems to be no H.-[illegible]— but Antitrichia curtipendula [illegible]. It seems very odd that one like Dr. Schimper should commit such an error, but only proves that human judgment, however great, is still fallible.

The first page of Lucia Summers' letter to Dr. Eaton dated April 1, 1879, in which she laments the identification error that led to her dashed hopes of having a new species of moss named for her. Letter courtesy of Yale University Library, Manuscripts and Archives.

of many of the plants they observed in each day's journey. At the time, of course, there were no regional floras that they could carry for reference. In fact, the journal specifically noted that all of their specimens were examined by Professor Daniel Cady Eaton of Yale University; Lucia and Professor Eaton corresponded extensively about specimen identifications. Presumably, many, if not all, of these specimens are still in the herbarium at Yale.

On this expedition, the Summers started south from McMinnville on the west side of the Willamette Valley, travelling through Polk, Benton, and Lane counties. The first night they camped on the Luckiamute River, and the second night on the Marys River. On the fourth day, June 3rd, their botanical sightings along the Long Tom River and Coyote Creek were described:

> "*Only a few plants have added themselves to the Yamhill list,* i.e. *a white larkspur, variety of species* elatum*, the tricolored* Mimulus*, Menzies'* Calandrinia, *the ebracteate* Gratiola. *Then on the Big Hill and the Coyote Creek Hills, the mountain flora so familiar to the Coast Chain, and the added monticola pine and a fragrant laurel, low and abundant, scenting all the forest, (we think it a* Ceanothus*). The richly tinted Oregon* Thermopsis *lastly arrays itself with the humble herbs along the way.*" (Cawley 1995).

They continued on south through the Umpqua Valley and over the divide from Canyonville to Grants Pass in the Rogue Valley, and then on to Ashland. From Soda Springs, south of Ashland, they turned eastward to ascend over the crest of the Cascade Mountains. In Robert's journal he noted for June 20th:

> "*We make our camp alone in this vast solitude, one lonely cabin or cabin store-house for the California Stage, being the only human sign for many hours. We name it Mountain Camp par excellance. Soon after leaving it, we begin to descend on the east side...The whole face of the country has changed. Not a familiar plant greets the eye beneath or beyond the cones themselves. Open glades abound, but the lupines, brilliant blues, white and yellow, the Eriogoni, pink or yellow, yes, even the compositae – all luxuriant and abundant each in its stations – are unfamiliar.*" (Cawley 1995).

Finally, on June 25th, after a journey of nearly four weeks from McMinnville, they arrived at their base camp on the Klamath Reservation. The Summers spent nearly two weeks on the Klamath Reservation, making day trips to nearby destinations, visiting the fort, and interacting with members of the Klamath tribe. Robert's journal describes the setting of their camp on the Wood River:

> "*Our tents under the weird black pines are beginning to seem like home and we nightly return to them with increasing delight. Tent life has a charm like nothing else: free and close to nature; a flickering blaze from great red embers; the stars at night shimmering through needle leaves and small slender cones; mountain, plain, and ice-cold river all within reach; the golden mumulion a great mossy log in the middle of it, and the blue mimuli on the borders of it; soldiers marching along with military precision; Indians stalking hither and thither, with unmilitary freedom and dignity – all so many elements of a picture cut out of a world so different from the one we habitually live in.*" (Cawley 1995).

Robert was keen to learn about their artifacts and customs, often bartering with individual Indians for their objects: tools, hats, jewelry, moccasins, etc. On one occasion, Robert tried to barter with an Indian woman for a necklace of shell beads and a beaver charm or *pomonskis*. However, the woman showed no interest in any of the items Robert offered her in exchange. Eventually Lucia, who was in the tent nearby pressing her plant specimens, and offered the very dress she was wearing in exchange for the necklace. "Instantly the *pomonskis* was removed from the Indian neck and extended towards her. Then, with a very indifferent air, the Botanist stepped into the tent, changed her dress, and handed it to the young Klamath as her price. It was only a calico affair, and not new, but it was a made garment, freshly laundered, and the women here are none of them seamstresses."

Finally, after celebrating the 100th anniversary of the Declaration of Independence with a large assembly of military officers, enlisted men, and Native Americans, the Summers departed the Klamath Reservation on July 7, 1876. Their north-bound return route followed the east side of the Cascades, crossing into the Deschutes River drainage. They continued to collect natural history specimens along the way, and Robert's journal is filled with detailed observations. After camping at Crescent Lake on July 19, they crossed the Cascade crest at Emigrant Pass, just south of Diamond Peak, and descended down the Middle Fork of the Willamette River. Once they reached the Willamette Valley, they headed north along the eastern side of the Valley and arrived at their home in McMinnville before the end of the month.

The Final Years, in San Luis Obispo

After living five more years in McMinnville, Robert resigned his ministerial post. In the spring of 1881, Robert and Lucia left the Pacific Northwest after more than a decade of residency. Their next, and final, home was San Luis Obispo, California, where Robert became the minister of the fledgling Episcopal Church. He resigned the position in 1885 and became the first paid librarian at the San Luis Obispo public library. Lucia continued to teach music and art, and to collect plant specimens. Robert died on July 5th, 1898; he was 70 years old. Only six months later, Lucia died on December 27, 1898, at the age of 63.

Our First Resident Botanist

It is difficult to summarize Lucia Summers' contribution to Pacific Northwest botany from 1871 to 1881. No doubt her specimens, most of which were sent back east, were important sources of information to the prominent East Coast botanists of her time (Pruski 1987). However, none of them saw fit to commemorate her contributions by naming a new species for her, and it is not clear whether any of her specimens were utilized as type specimens of newly described taxa. Certainly, she collected many specimens in the Pacific Northwest: her collection number series in Oregon spans over 1,000 numbers, from #1000 to at least #2100. Her later California collections, which are databased by the UC Berkeley Herbarium, include over 500 records.

After Lucia's death, Phoebe Hearst purchased her herbarium (Jepson 1931). Hearst, a regent of the University of California, donated the collection to the University of California herbarium in 1903. The herbarium consisted of 3,493 sheets (University of California 1904). While the significance of the herbarium to the University was based upon her collections from California, it also apparently included thousands of non-California specimens. Unfortunately, Summers' non-California specimens at the University of California are not data-based at this time, but if, as the math suggests, nearly 3,000 of Summers' herbarium sheets were not California collections, many of this total would likely have been collected in Washington and Oregon. Thus, this collection represents a valuable and largely untapped resource of early Pacific Northwest botany! In addition to the UC specimens and the small number at OSC, Lucia's collections are also found in major herbaria including the New York Botanical Garden, Yale University Herbarium, and the Gray Herbarium at Harvard University.

Even in their time, the Summers were a bit archaic, viewing the western landscape and its overwhelmed native cultures through the lens of the Romantic Period. Robert's descriptions of landscapes and encounters with native people read very much like the journals of William Bartram, who explored the southeastern United States a century earlier, and whose journals were an important influence on the artists and writers of the Romantic Period. But by the late 1800s, the cultural zeitgeist in ascendance in western North America was clearly looking forward, with the closing of the frontier, an emphasis on developing technology, and exploiting the region's natural resources for economic benefit. The work and writings of Lucia and Robert Summers show us that this worldview was not unanimously accepted at the close of the nineteenth century.

Acknowledgements

I thank staff from the Oregon State University Herbarium, St. Barnabas Episcopal Church, University of California Herbaria, and Yale University Library, for providing images and archival materials used in preparing this essay. John Christy provided helpful biographical information, and Rhoda Love also helped obtain the photograph of the specimen of *Toxicoscordion venenosus*. An earlier version of this essay appeared in Botanical Electronic News #395.

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Ed Alverson serves as Willamette Valley Stewardship Ecologist for The Nature Conservancy, a position he has held since 1991. He completed a Masters of Science degree in botany (biosystematics of the fern genus *Cryptogramma*) in 1989 at Oregon State University, and has been working as a field botanist in the Pacific Northwest for 30 years. He has written over 50 technical and popular articles about the flora and vegetation of this region, and his photographs have appeared in a variety of publications including cover photos on Art Kruckeberg's book, "Gardening with Native Plants in the Pacific Northwest" and the cover of the book "Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia." Ed's interests include history of botanical exploration, pteridology, floristics and biogeography of the Pacific Northwest, and the conservation and management of prairie and oak habitats in the Willamette Valley-Puget Trough-Georgia Basin Ecoregion. He lives with his family in a 100+ year old house in a former oak savanna in the suburbs of northwest Eugene. Photo by Peter Zika.

Unlikely Pairing of Two Alien Species in Oregon Produces Unwanted Offspring

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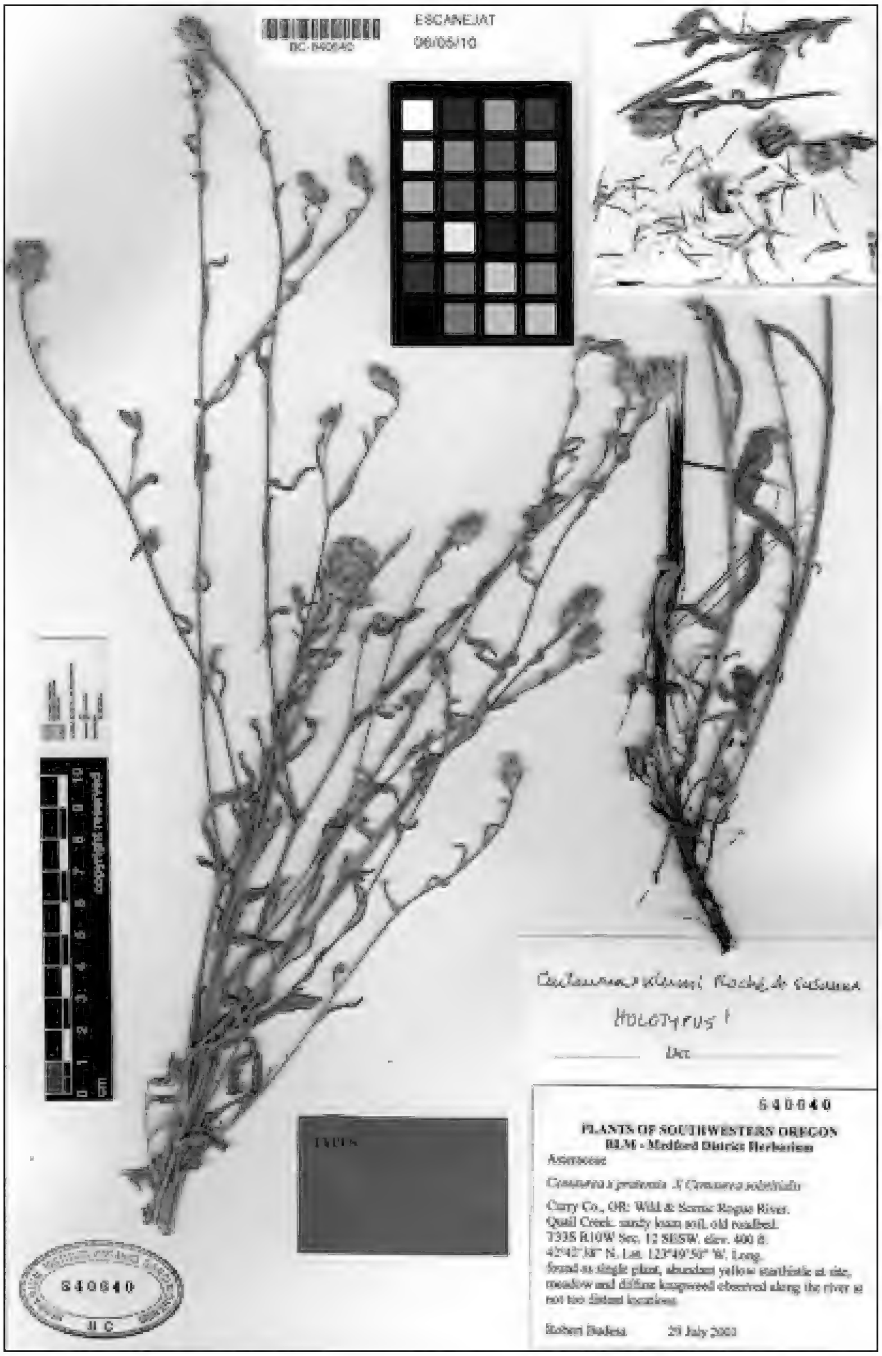
"Great Migrations" are commonly associated with animals. But plants migrate too, and they often use humans, who travel, farm, and graze domestic livestock, to expedite long-distance dispersal. These hitch-hikers are usually considered weeds in their new environments. One of the oldest examples, since Neolithic times (Rösch 1998), is cornflower (*Centaurea cyanus*), so named for its association with cultivated cereal grains. Although the development of herbicides reduced the impact of cornflower on crop yields, other species of *Centaurea* rank among the worst noncropland weeds in Oregon: yellow starthistle (*C. solstitialis*), diffuse knapweed (*C. diffusa*), spotted knapweed (*C. stoebe* = *C. maculosa*), squarrose knapweed (*C. virgata* ssp. *squarrosa*) and meadow knapweed (*C. moncktonii* = C. *pratensis*[1]) (Roché and Roché 1991).

Invasion of new regions brings species together that formerly were seldom (if ever) in close proximity. Sometimes this creates opportunities for hybridization. For example, meadow knapweed, a cross between brown and black knapweed (*C. jacea* x *C. nigra*), was been widely known in Europe before it was introduced in North America as a hybrid swarm (a mix of plants that included both parents and hybrids, and hybrid derivatives including F1s, F2s and backcrosses).


ESCANEJAT
06/05/10
Centaurea x kleinii Roché & Susanna
HOLOTYPUS !
540040
PLANTS OF SOUTHWESTERN OREGON
BLM - Medford District Herbarium
Robert Budesa

Holotype of *Centaurea x kleinii*, collected by Robert Budesa in Curry County, Oregon, housed at the herbarium of the Institut Botànic de Barcelona (BC).

An Oregon *Centaurea* Goes to Barcelona

In 1998, Jeanne Klein (now Standley) collected a "robust and attractive" knapweed with yellow and lavender flowers along the Cow Creek Road while working for the Roseburg District Bureau of Land Management (BLM). The plant that originally caught her eye was a pale and silvery version of meadow knapweed, a weed that was abundant in the area. Besides the difference in flower color, she noted that "the bracts were different than meadow knapweed," and she wondered what species she had stumbled upon. "Most likely another noxious weed," she thought, "but a really pretty one!" Some plants had lavender flowers, and some had pale yellow flowers. She couldn't wait to key it out. When keying didn't produce results, the mystery deepened. She had noted the adjacent meadow knapweeds and yellow starthistle and began to wonder if the two had hybridized. That's when she enlisted the aid of other botanists. Ken Chambers at the OSU herbarium was stumped. Then, a chance meeting with a BLM manager from the Medford District (Robert Korfhage) provided a connection with his fiancée who had worked with knapweeds at Washington State University. As luck would have it, Cindy Roché was headed back to Spain to complete her post-doctoral research on *Crupina*. She offered to take pressed specimens to the group in Barcelona that was working on *Centaurea* systematics. Another BLM weed specialist, Bob Budesa, collected a similar plant on the Rogue River at Quail Creek (Curry County) and Jeanne found more plants at new locations in Douglas County. Last year we published an article describing it as a hybrid, honoring Jeanne as the discoverer and using Bob Budesa's collection as the type specimen (Roché and Susanna 2010). Since then, Barbara Mumblo, botanist with the Forest Service, reported a collection she made of the hybrid in 2006.

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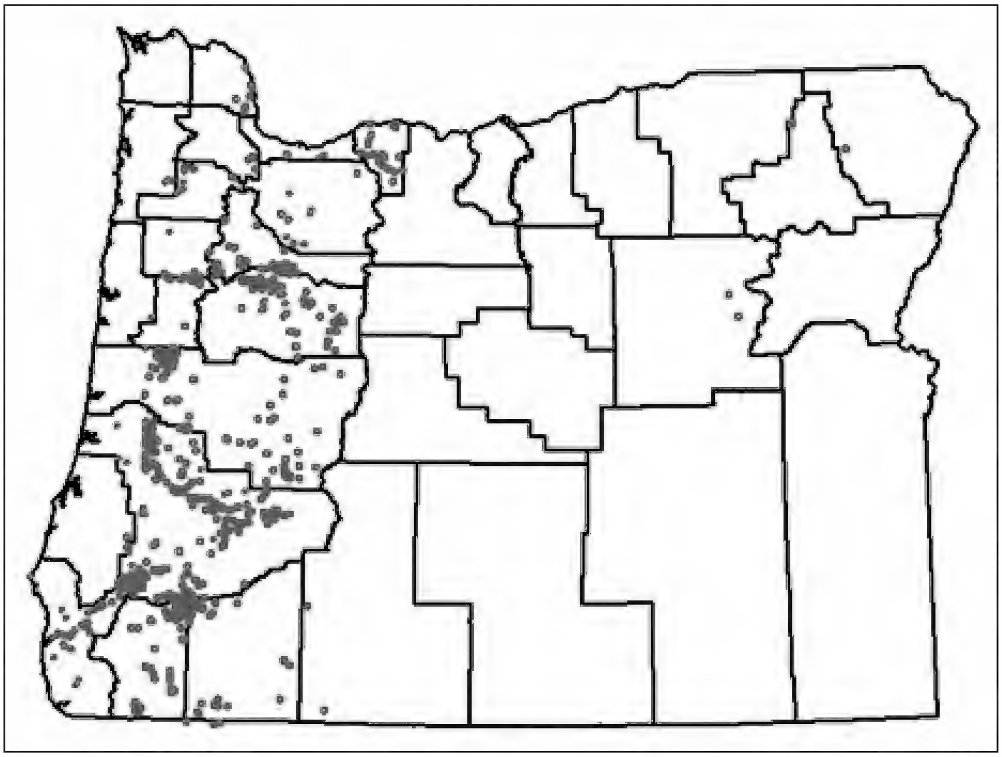
[1] *Centaurea pratensis* Thuill. and *C. debeauxii* Gren. & Godr. are among previous names widely used for the hybrid between *C. nigra* and *C. jacea*, but according to Wagenitz (1987), the correct name for this species is *C. moncktonii* C. E. Britton. This is also the accepted name in the Flora of North America (Keil and Ochsmann 2006).

Against the Odds

The specimens looked like a hybrid between yellow starthistle and meadow knapweed. This combination is entirely unexpected for two reasons: these two taxa have incompatible chromosome numbers and are very distantly related, even though both putative parents belong to the large *Centaurea Jacea* clade (group of close relatives) that stands as the core group of the genus *Centaurea* (Garcia-Jacas *et al.* 2006). Under a geographic classification system, they segregate into two different clades. Brown and black knapweed (therefore, meadow) belong to section *Jacea*, which is in the clade of widely distributed species. *Centaurea solstitialis* belongs to section *Mesocentron* among the Western Mediterranean group of species (Garcia-Jacas *et al.* 2006). Thus, meadow knapweed and yellow starthistle are very distant relatives, even though the important characters that define the *Centaurea Jacea* clade (pollen type "*Jacea*" and achenes with a double pappus and lateral hilum).

The other reason that these two taxa should not cross is the difference in chromosome numbers. Based on multiple counts (Watanabe 2010), meadow knapweed is a tetraploid with $2n = 4x = 44$, while yellow starthistle is diploid with $2n = 16$. Probability of viable offspring from this incompatible combination should be extremely low. Yet, the apparent hybrid has been found in five separate locations; the distance and lack of seed production indicate that the hybrids arose from independent crossings.



Distribution of meadow knapweed in Oregon. Map courtesy of Weed Mapper, Oregon Dept. of Agriculture (http://www.oregon.gov/ODA/PLANT/WEEDS/weedmapper.shtml).

Morphologically, the hybrid is similar to meadow knapweed, but with obvious traces of its yellow starthistle ancestry in floret color, shape of the bracts surrounding the flower head, and hairiness of leaves and stems.

Geographic Origins and Expansion

Yellow starthistle is widely distributed along the Mediterranean region in its broadest sense, from Iran and Turkey to the Iberian Peninsula and North Africa. It originated in the Eastern Mediterranean, but has expanded to the entire Mediterranean region, usually associated with human disturbance. As an alien invader, it has colonized extensive areas in the western US, South America and Australia. Yellow starthistle became established in California in the mid-1800s and by 2000 infested more than four million hectares (Thomsen *et al.* 1996). It was first reported in Oregon in Douglas County in 1914 (Roché and Talbott 1986).

Meadow knapweed is a frequent and fully fertile hybrid between black knapweed and brown knapweed. Black knapweed is native to the British Isles, with hybrids being common when brown knapweed was introduced from the European continent (Marsden-Jones and Turrill 1954). Ockendon (1975) described the reverse situation in France, suggesting that brown knapweed was native and black knapweed introduced, which is highly questionable following Dostál (1976). Either way, because the F1 hybrid can back-cross with either parent and with other F1 individuals, hybrid swarms normally completely replace the pure forms. Both the parent species and the hybrid are common in Eurasia, becoming rare to the East.

The earliest reports of meadow knapweed in Oregon date to 1911 and 1918 in the Willamette Valley from Portland to Eugene (Roché and Talbott 1986). Howell (1959) reported that meadow knapweed was cultivated for winter forage near Roseburg (where it remains abundant today). It is leafier and more palatable to livestock than other knapweeds, but as plants mature, both palatability and nutritional value decline (Roché and Roché 1991).

Ecological Distribution

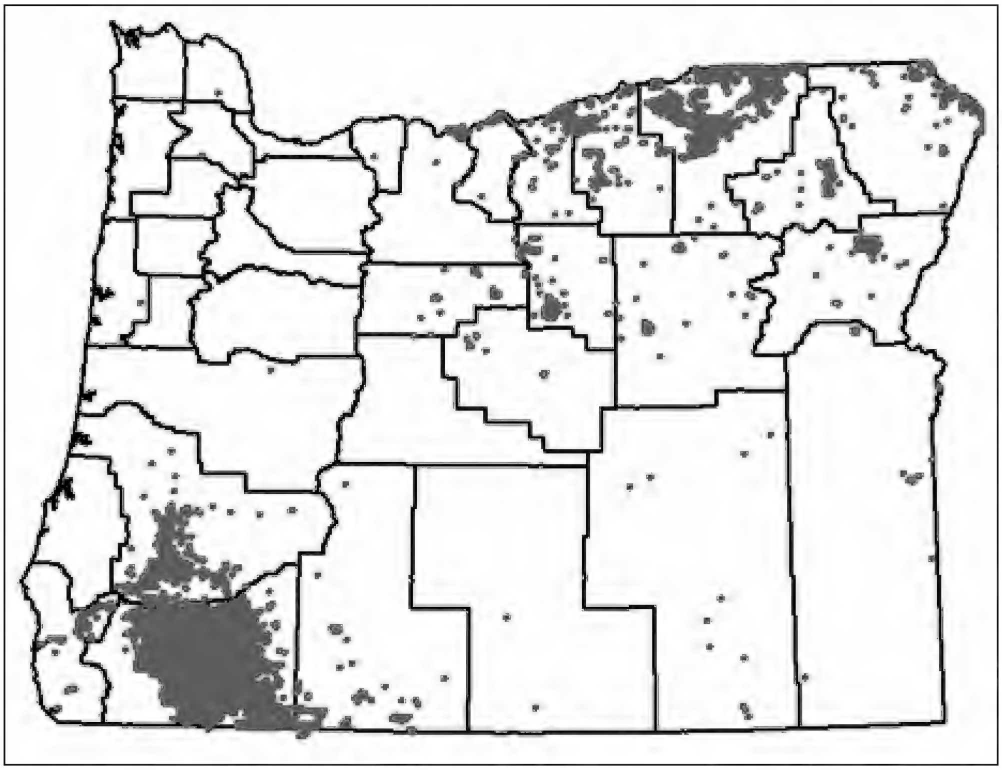
In its native range, yellow starthistle seldom grows in the mountains, being restricted to the Mediterranean climate of its origin. In western North America, its distribution is also correlated to Mediterranean climates, with the most aggressive invasion in California. In the more northern latitudes (*e.g.*, Washington State, ca. 46° to 49° North), it is restricted to sunny, warm habitats such as south slopes at lower elevations, and despite repeated introductions, does not persist in British Columbia, Canada (Roché and Thill 2001). In Oregon, it is most competitive in the Mediterranean climate of the inland valleys between the Cascade and Coast Range mountains (a small, northern extension of the Central Valley of California), the warm basalt slopes in the Columbia Gorge, and south slopes in the foothills of the Blue Mountains.

As its common name suggests, meadow knapweed is a meadow plant, and according to most monographers (*e.g.,* Marsden-Jones and Turrill 1954, Wagenitz 1987), in the Mediterranean region it grows only in the moistest places in the mountains. In western North America, meadow knapweed extends from coastal northern California through Oregon and Washington into British Columbia, primarily in moist forested regions and in meadows, irrigated pastures, and riparian zones (Roché and Johnson 2003). The largest populations of meadow knapweed in Oregon are in the interior valley lowlands (Umpqua and Willamette Valleys) including both the east slopes of the Coast Range and the west slopes of the Cascade Range. In Douglas County the Klamath Range forms a mountain bridge between the Coast and Cascade Ranges; annual precipitation ranges from about 33 inches in the lowland valleys to over 51 inches in the foothills. Substantial populations also grow on the mesic eastern slopes and valleys of the Cascade Range near Hood River in the Columbia River Gorge in northern Oregon.

With a Little Help From Some Bees?

Centaurea species in general are entomophilous (insect pollinated) and are visited by a wide range of species for pollen and/or nectar (Marsden-Jones and Turrill 1954). Each disc floret contains both male and female flower parts, offering both pollen and nectar. To collect these rewards, an insect pushes its proboscis into each open floret separately. By moving successively across the head, it can pollinate many florets by crawling a very short distance, or by simply turning. Each floret has one ovule requiring only one viable and compatible pollen grain to bring about fertilization (Marsden-Jones and Turrill 1954).

Contact between meadow knapweed and yellow starthistle within the range of their native distribution is infrequent because their ecological requirements differ so greatly. What differs in southern Oregon is not the biology of the plants, but that appropriate habitats occur within flight range of the pollinators. Both species share disturbed sites on roadsides that are adjacent to mesic meadows and riparian zones that support meadow knapweed and warm south-facing slopes that are dominated by yellow starthistle.



Distribution of yellow starthistle in Oregon. Map courtesy of Weed Mapper, Oregon Dept. of Agriculture (http://www.oregon.gov/ODA/PLANT/WEEDS/weedmapper.shtml).

Is This a New Weed?

The new hybrid is morphologically much closer to meadow knapweed. It is sterile, producing neither seeds nor viable pollen (Carol Mallory-Smith, pers. comm.). In its current form it could show weedy behavior as a perennial herb only through clonal reproduction. Yellow starthistle spreads exclusively by seed, but root and crown fragments of meadow knapweed regrow when disturbed by heavy equipment or cultivation (Roché and Johnson 2003). Alternatively, this sterile hybrid could be one mutation away from becoming a "super weed." *Crupina intermedia* is a robust weedy invader that arose when *C. crupinastrum* (2n = 28) hybridized with *C. vulgaris* (2n = 30) and subsequently became tetraploid (2n = 4x = 58) (Couderc 1975). A parallel scenario for *Centaurea x kleinii* could yield a fertile hybrid with exceptional vigor (2n = 4x = 60). Fortunately, recent surveys indicate that control work by the BLM has been effective in eradicating the hybrid populations. No plants were found in 2010 at any of the BLM locations that formerly supported these hybrids. We don't know why it took over 100 years of co-existence in Oregon for hybrids to appear, but it's clear that predicting weed behavior in new environments is a dangerous game. New introductions often experience a lag period before becoming invasive, so erring on the side of prevention is always recommended.

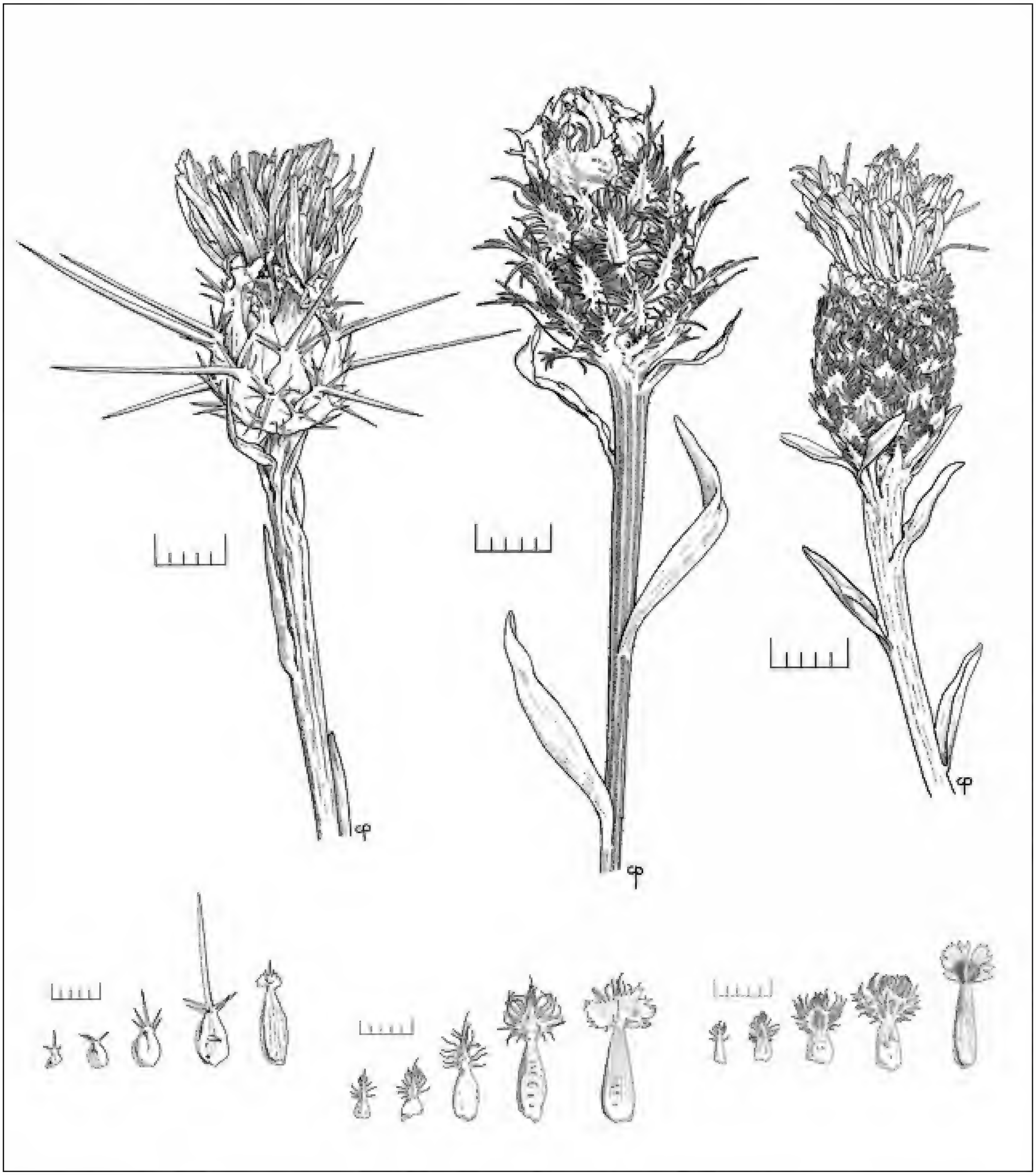


Illustration of capitula and phyllary bracts of yellow starthistle, meadow knapweed, and the hybrid between them. Scale: 5 mm in each.
Drawings by Carles Puche.

Collection Sites

Curry County: Wild & Scenic Rogue River. Quail Creek. sandy loam soil, old roadbed. T33S Rl0W Section 12 SE¼ SW¼. Elevation 400 ft. 42°42'38" N. Lat. 123°49'50" W. Long. Found as single plant, abundant yellow starthistle at site, meadow and diffuse knapweed observed along the river at not too distant locations. Robert Budesa 29 July 2001.

Douglas County: Cow Creek Road, approximately 20 miles southwest of city of Riddle. Growing along roadside between road and Cow Creek. Elev. 290 m. 42° 50.303' N. Lat. 123° 37.204' W. Long. Associated species: *Pseudotsuga menziesii, Rubus discolor, Cytisus scoparius, Centaurea pratensis, Centaurea solstitialis, Daucus carota, Eschscholzia californica, Avena barbata*. Jeanne M. Klein; 07 September 2000.

Douglas County: Myrtle Island, near Tyee. 43° 28.426' N Lat. 123° 32.373' W Long. [T24S R7W Sec. 20] On leading edge of the island in cobbles and sandy soil. Elev. 70 m. Associated species: *Centaurea pratensis, Centaurea solstitialis, Rubus discolor, Chondrilla juncea*. Jeanne Klein & Pete Figura; 20 July 1998.

Douglas County: Island Creek BLM Day Use Area, along Cow Creek Road. Elev. 230 m. 42° 54.772' N. Lat. 123° 28.938' W. Long. Growing along roadside with *Vulpia myuros, Aira caryophyllea, Cynosurus echinatus, Madia* sp., *Pinus ponderosa, Rubus discolor, Centaurea solstitialis, Centaurea pratensis*. Cindy Roché & Jeanne Standley; 28 July 2003.

Curry County: along Rogue River at west end of Road 250, northern edge of gravel bar on north bank of river. T35S R13W Section 33 SWSW 42°29'59"N. Lat. 124°15'33"W. Long. 100 ft. elev. (From Gold Beach take Road 33 toward Agness, cross over the Rogue River at Lobster Bar and go to Road 3533; continue east ca. 2.5 miles to small road #250). One plant collected. Both *Centaurea moncktonii* and *C. solstitialis* in vicinity. Barbara Mumblo #7180601BAM 18 July 2006.

Acknowledgements

Jeanne Standley (BLM Coos Bay District), Bob Budesa (retired, BLM Medford District) and Barbara Mumblo (Rogue River-Siskiyou National Forest) provided information for known sites of the hybrid. Carol Mallory-Smith, Oregon State University, has maintained a small population in cultivation for six years and provided information on infertility. The Oregon Department of Agriculture (Weed Mapper; http://www.oregon.gov/ODA/PLANT/WEEDS/weedmapper.shtml) provided maps of yellow starthistle and meadow knapweed in Oregon. Carles Puche of the Botanic Institute of Barcelona created the wonderful line drawings.

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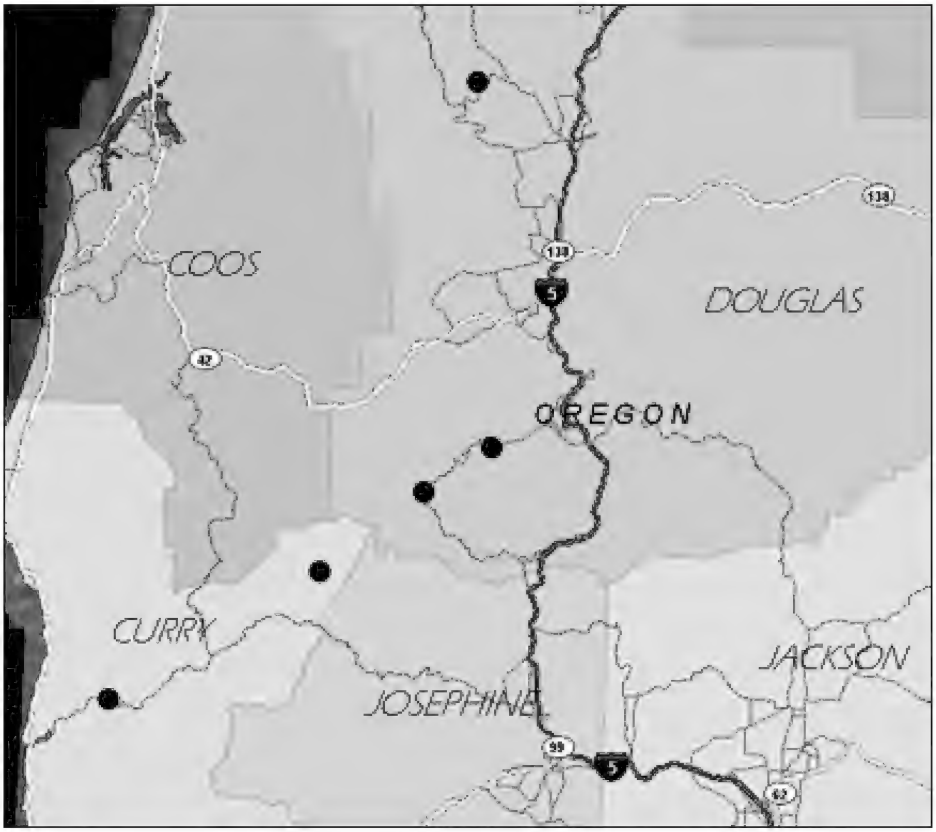

Location of the five collections of *Centaurea x kleinii* in Douglas and Curry counties, Oregon. Map prepared by Stephen Meyers, Oregon Flora Project.

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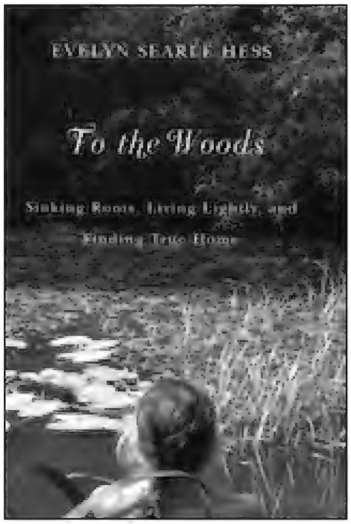

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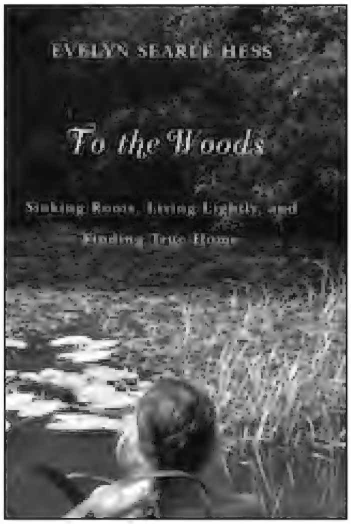

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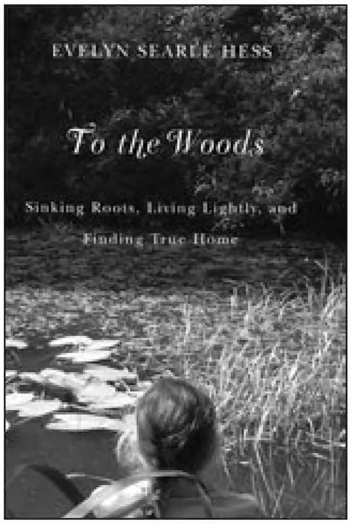

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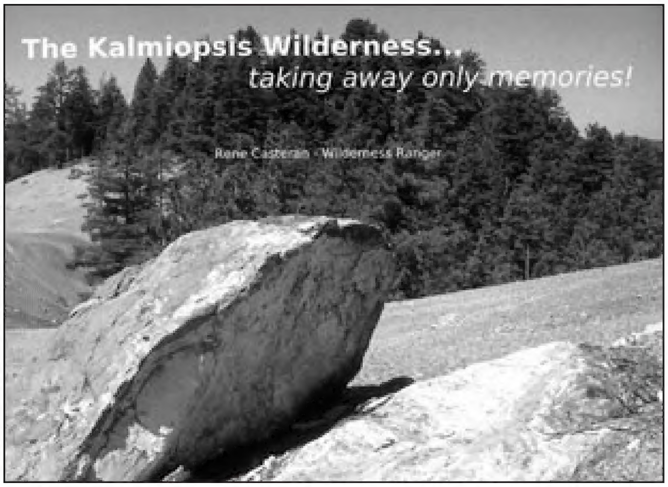
As Evelyn writes, she and her husband "… said good-bye to telephones, television, and electrical appliances …We would make do." Early on they dug a pond for irrigation. The book's

cover features Evelyn herself sitting beside the pond. After moving from Eugene to their acreage, their earliest plantings were twelve hundred blueberries of six varieties, followed by beds of lavender, rosemary, and various sages. At one point they spread "topsoil" and were rewarded with thousands of Canada thistles! Philosophically Evelyn writes, "We were frustrated by all our ignorance and missteps, but undaunted."

I was delighted by Evelyn's story of living, working and developing a viable native plant nursery on the cut-over Oregon land, and I recommend *To the Woods* to any reader with a sense of adventure and a love of nature, gardening, and good writing.

–Rhoda Love, Emerald Chapter


The Kalmiopsis Wilderness...
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Rene Casteran - Wilderness Ranger

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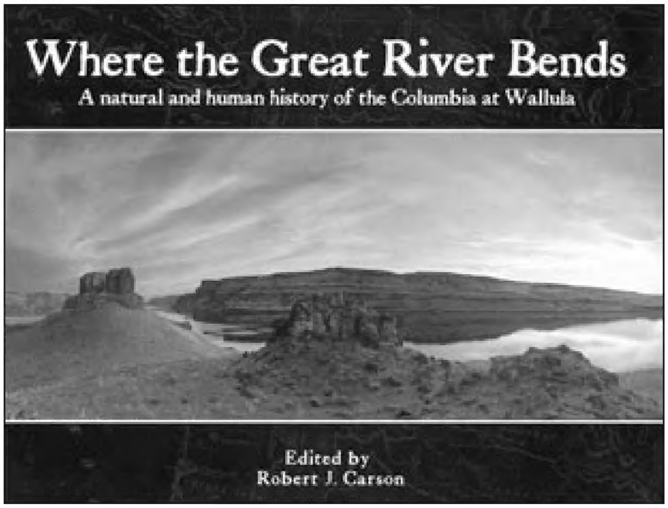
Casteran, R. 2010. Blurb.com Publishing ISBN 978-1-4507-3528-5. Available in the Southern Oregon University library and Jackson and Josephine county libraries.

The Kalmiopsis Wilderness...taking away only memories! is a privately published hardcover book by Rene Casteran, who was a Wilderness Ranger for the Siskiyou National Forest from 1986 to 2008. Starting with a background in botany and ecology, Casteran gained an unparalleled knowledge of the Kalmiopsis Wilderness during the 23 years he served as its primary steward.

The 218-page book is a personal memoir presented as series of color photographs, line drawings and cartoons, interspersed with scanned images of his (mostly legible) field notes. Photos are digitized images, mostly from 35 mm color film.

The book is organized around a series of themes: Wilderness Rangers, Botany, Geology, Heritage Resources, the Navy Monument, Wildfire (including the Biscuit and Madstone fires), Plant Diseases, Water Monitoring, Encounters with Miners and Environmental Advocates, Trail Crews, Mining (historic and modern), Lou Gold on Bald Mountain, Wild and Scenic Rivers, Unusual Float Trips. The book ends with a section on The Endless Diary and a list of "tales not told."

There is no Table of Contents, Index, List of Figures, or numbered pages. Reading it is a Wilderness adventure with a surprise at every turn (of the page, not trail). Finally, the reader must remember that Casteran never intended his book to be widely published or sold for profit. That said, his personal memoir is a great introduction to one of the Nation's most rugged wild places, a must read if you have never been there, a must read if you have. *–Frank Lang, Siskiyou Chapter*


Where the Great River Bends
A natural and human history of the Columbia at Wallula
Edited by
Robert J. Carson

Where the Great River Bends: A Natural and Human History of the Columbia River at Wallula

Carson, R.J., M.E. Denny, C.E. Dickson, L.L. Dodd, and G. T. Edwards. 2008. ISBN 978-1-879628-32-8. 220 pp. Keokee Books, Sandpoint, Idaho. www.KeokeeBooks.com; $35 paper.

This book explores a fascinating natural feature in our neighbor state to the north (Washington): a place called Wallula, where the Columbia River turns around to flow west. Shortly afterwards it forms the northern boundary of Oregon. With its relatively barren landscape, impounded water and paper mill, most of us probably zoom right by without a second thought when we happen to be traveling through this area. However, as Kareen pointed out in her article, the more we know, the more we see. If you plan to drive State Route 12 from Tri-cities to Walla Walla or Highway 730 north from Hermiston, Oregon, I highly recommend that you read this book first. Stop and see the Twin Sisters and marvel over the basalt flows, hike up Juniper Canyon, and follow the mile-by-mile interpretative route on Wallula Gap Road from Sand Station, Oregon, to Wallula Cemetery, Washington. The book features sections on geography, geology, biology, pre-history, 19th and 20th Century history, and lists of flora and fauna found in the area. Eat a picnic lunch at Madam Dorion Park, named for a Native American woman who, under incredibly difficult circumstances, traveled from Missouri to Wallula in 1811-12 with the Wilson Price Hunt Party of the Pacific Fur Company.

The book is amply illustrated with beautiful photographs of places you'll want to see firsthand. If you get the book, you may go out of your way to visit Wallula, which means, among other things, "a small stream running into a larger one," that is, where the Walla Walla River merges into the Columbia River.

–Cindy Roché, Siskiyou Chapter

Jan and Dave Dobak

Dave was born in 1946 in New York and grew up in New York and Washington, DC. His earliest memories of being inspired by plants were on family visits to the New York Botanical Garden. He earned degrees in Electrical Engineering from the University of Colorado and Stanford University. Moving to the Rocky Mountains opened a new viewpoint on plants. In 1973 he moved to Oregon, where he worked for Tektronix in Beaverton for 27 years; he retired in 2001.

Jan Anderson was born in 1947 in Ohio; her family soon moved west to live successively in Montana, Oregon, and Washington. Her earliest memories of plants date back to family backpacking trips in the Olympic Mountains. She earned a degree in Biology from Eastern Washington University. A course in field botany, and frequent visits to Turnbull National Wildlife Refuge shifted her attention from marine biology to botany. She moved to Oregon in 1972 and worked in the laboratory at Good Samaritan Hospital in Portland for 27 years; she retired in 2001.

Their paths had not yet crossed when, coincidentally, in 1984 they both joined the Portland Chapter of the Native Plant Society of Oregon (NPSO). Lois Kemp recruited them to lead a field trip for the NPSO Annual Meeting in May 1987. One thing led to another and in February 1988, they were married at the Leach Botanical Garden in Portland.

Jan started editing the NPSO Bulletin in January of 1986–the era of typewriters and white-out, when "cut and paste" involved scissors and glue. Using NPSO's first MacIntosh computer, Jan and Dave worked together to bring the Bulletin into the computer age. They passed the editorship to their successor in July 1989.

By May 1991, they had sufficiently recovered from the demands of producing the monthly Bulletin to assume the duties of Membership Chair. Together they handled all the membership responsibilities for the State until October 2003, a period of more than twelve years. They still serve as members of the Membership Committee, as well as the Budget Committee. They have produced the biennial Membership Directory since 1988, and have brought it into the computer age as well, with most of the directories now going out electronically as PDF (Portable Document Files).

Each one has served several terms on the State Board of Directors. For decades, they rarely missed State Board meetings. Dave assisted Jean France during her years as State Treasurer in the late 1990s.

They have led numerous field trips, both for their chapter and for State Annual Meetings. Catherine Creek, Grassy Knoll, Lookout Mountain, and the Siskiyou Mountains number among their favorite destinations.

They also served twice as Portland Chapter Vice-President (for Programs). They suggested the first "extra-territorial" NPSO Annual Meeting, which was sponsored by the Portland Chapter in John Day in 2003. Their botanical travels in Switzerland, Italy, Chile, Australia, South Africa, Wyoming, and Nevada have put them in demand as speakers, and they have generously provided programs for many chapters.

Irrepressible joiners, they are members of the California, Washington, Montana, Wyoming and Big Horn Native Plant Societies, the Hardy Plant Society of Oregon, the North American Rock Garden Society, the (British) Alpine Garden Society, the Scottish Rock Garden Club, the Botanical Society of South Africa, the Wildflower Society of Western Australia, and the Western Australia Native Orchid Society.

Although their home garden is not restricted to Oregon native plants, it does emphasize plants in their natural state, rather than genetically modified horticultural hybrids or cultivars–sort of a "native plants of the whole world" garden.

–Jim Duncan, Siskiyou Chapter

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Members of the Native Plant Society of Oregon and others are invited to submit articles, book reviews, artwork, and photographs for publication in *Kalmiopsis*. All materials submitted should pertain to Oregon's native vegetation and flora. Acceptance will be based on suitability (articles dealing with formal nomenclatural proposals or of a highly technical nature are not acceptable). *Kalmiopsis* publishes two series articles: *Plant of the Year*, and *Oregon Plants, Oregon Places*. We also publish articles about botanical history and features related to native plants or plant communities in Oregon.

Please consider that the readers of *Kalmiopsis* are people with varied educational backgrounds and all articles must be comprehensible to a broad, but relatively well educated, audience. The goals of *Kalmiopsis* are to disseminate correct information about and generate interest in native plants, thus each article is reviewed by the editorial board and selected technical reviewers before publication.

Contributions of artwork and photographs without accompanying manuscripts are welcome; color submissions must be suitable for publication in grayscale. Contact the *Kalmiopsis* editor to request a copy of Instructions to Authors, or to inquire about the suitability of an idea for an article.

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